GURPS Fourth Edition

HIGH-TECH™

By Shawn Fisher, Michael Hurst, and Hans-Christian Vortisch

STEVE JACKSON GAMES

GURPS® Fourth Edition

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Written by SHAWN FISHER, MICHAEL HURST, and HANS-CHRISTIAN VORTISCH
Additional Material by DAVID L. PULVER, SEAN PUNCH, GENE SEABOLT, and WILLIAM H. STODDARD
Edited by SEAN PUNCH
Cover Art by ABRAR AJMAL and BOB STEVLIC
Illustrated by BRENT CHUMLEY, IGOR FIORENTINI, NATHAN GEPPERT, BRENDAN KEOUGH, and BOB STEVLIC

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GURPS System Design ▌STEVE JACKSON
GURPS Line Editor ▌SEAN PUNCH
Indexer ▌NIKOLA VRTIS
Page Design ▌PHIL REED and JUSTIN DE WITT
Managing Editor ▌PHIL REED
Production Manager ▌MONICA STEPHENS
Art Director ▌WILL SCHOONOVER
Production Artists ▌ALEX FERNANDEZ and PHIL REED
Print Buyers ▌SHELLI GALEY and MONICA STEPHENS
Marketing Director ▌PAUL CHAPMAN
Sales Manager ▌ROSS JEPSON
Errata Coordinator ▌ANDY VETROMILE
GURPS FAQ MAINTAINER ▌STÉPHANE THÉRIAULT

Research Assistance: Scott Biddle, Rupert Boleyn, Douglas Cole, Barry Cooper, Russel Hiatt, John Johnson, andi jones, Matt Jones, François Marcadé, Nigel McCarty-Eigenmann, Kenneth Peters, and Richard Taylor

Lead Playtester: Douglas Cole

Playtesters: Rafael Acevedo, Daniel Boese, Rupert Boleyn, Frederick Brackin, Roger Burton West, Giuseppe Chiapparino, C. Lee Davis, Matt Jones, Jonathan Lang, Jason Levine, MA Lloyd, Nigel McCarty-Eigenmann, Jeff Raglin, and Emily Smirle

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About *GURPS*

Steve Jackson Games is committed to full support of ***GURPS*** players. Our address is SJ Games, P.O. Box 18957, Austin, TX 78760. Please include a self-addressed, stamped envelope (SASE) any time you write us! We can also be reached by e-mail: **info@sjgames.com**. Resources include:

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Bibliographies. Many of our books have extensive bibliographies, and we're putting them online – with links to let you buy the books that interest you! Go to the book's web page and look for the "Bibliography" link.

Rules and statistics in this book are specifically for the ***GURPS Basic Set,*** *Fourth Edition.* Page references that begin with B refer to that book, not this one.

Introduction

GURPS High-Tech covers the technology available from the late 18th century (TL5) to the present day and relatively near future (TL8). It's crammed with guns, explosives, entry tools, climbing kit, scuba gear, radios, vehicles, and everything else that a group of adventurers might need – whether they're exploring trackless wastes, pulling off a heist, or running a spy ring. Most of the items it describes are based on specific, historical devices . . . but the treatment is intentionally *generic,* making the equipment useful even in non-historical campaigns.

High-Tech doesn't simply list technical specs and game stats for the items it describes, though. It gives you everything you need to *use* them in play. There are notes on how to purchase equipment (legally and illegally), guidelines for building and modifying gear, and new firearms rules, techniques, and perks to support both ultra-realistic and cinematic gunplay.

Most important, ***High-Tech*** is a book for *heroes:* dangerous men and women on secret missions . . . intrepid explorers slashing a path through a sweltering jungle . . . iron-tough adventurers braving the steely knives of an arctic blizzard. It provides the finishing details that distinguish one mercenary or super-spy from another. Attributes, advantages, and skills may define the hero, but his possessions can be just as important. A "Mare's Leg" Winchester or a LeMat revolver instead of the predictable Colt Peacemaker can make an Old West gunslinger stand out from his peers!

Distinctive clothing, gear, and weapons can also help make an adventurer an instantly recognizable *icon* in the campaign world. Fiction is packed with examples of personality going hand-in-hand with possessions: Indiana Jones' fedora and bullwhip; Thomas Magnum's Hawaiian shirt and Ferrari 308; James Bond's tuxedo and Walther PPK. In each case, unique belongings support and complete the persona of a quirky and memorable protagonist.

Thus, ***High-Tech*** takes the view that an adventurers' kit should be a reflection of his background and character traits – a symbol of his upbringing, attitude, and personality – and not just a collection of game stats and bonuses. Colombo wears a grimy overcoat in balmy California; Sherlock Holmes has his deerstalker cap and drop-stem pipe (details added not by Doyle but by illustrators and actors later on). Such touches make it easier to visualize characters who live only in the players' imagination, and provide "hooks" that the GM can use throughout the campaign.

Publication History

This is the fourth edition of ***GURPS High-Tech.*** It replaces ***GURPS High-Tech,*** *Third Edition* (1998) – itself revised by David Pulver from earlier editions written by Michael Hurst – and ***GURPS Modern Firepower*** (2002). Inspirational ***GURPS*** *Third Edition* supplements include ***GURPS Special Ops,*** *Third Edition* (2002) and ***GURPS Covert Ops*** (2003). ***GURPS Old West,*** *Second Edition* (2000), ***GURPS Cops*** (2001), and the entire ***GURPS WWII*** line (2001-present) were also influential. *Pyramid* articles adapted for this work include "Autocannon," "In Her Majesty's Service," "The Long Arm of the Law," and "Secret Weapons" – all by Hans-Christian Vortisch. Finally, ***GURPS Ultra-Tech,*** *Fourth Edition* (2007) and ***GURPS Vehicle Design*** (2007) were developed concurrently with ***GURPS High-Tech,*** and the authors exchanged ideas liberally.

The current volume is a new work, not a revision of any of the above – they served primarily as sources of concepts, references, and terminology, not text.

About the Authors

Shawn Fisher has a master's degree in education and is currently a technical writer with a major IT company. A former teacher and infantryman, he has over a decade of experience in private security and is a certified law-enforcement firearms and defensive-tactics instructor. His previous works include ***GURPS WWII: Dogfaces*** and ***GURPS WWII: Hand of Steel,*** and contributions to ***GURPS Best of Pyramid 1, GURPS Who's Who 1,*** and Amarillo Design Bureau's ***GURPS Module Prime Alpha.*** Shawn has been an avid gamer since the early 1980s, and devotes his spare time to camping and recreational shooting. He lives in Searcy, Arkansas with his wife, Jennifer, and their two daughters, Elizabeth and Rachel.

Mike Hurst served as an artilleryman in Viet Nam. He has also been a security officer (both uniformed and undercover); a tank commander in the Texas National Guard; and Captain of the Guard of the Barony of Bryn Gwlad. He is an NRA-certified firearms instructor and holds a Texas Reserve Police Officer certification. He possesses two dogs, an undetermined number of cats, and several thousand books, mostly history and science fiction. He has been a wargamer and miniatures gamer for more than 20 years, and shows no sign of reforming. On the other hand, his beloved wife, Brenda, who shoots ambidextrously, insists he had better quit playing and commence writing.

Hans-Christian "Grey Tiger" Vortisch, M.A., studied languages in Berlin and London, and is currently pursuing a law degree. He began writing for ***GURPS*** as a freelancer in 2001. He was author or co-author of ***GURPS Covert Ops, GURPS Modern Firepower, GURPS Special Ops,*** *Third Edition,* ***GURPS WWII: Motor Pool,*** and several *e23* publications on military topics. He wrote additional material for numerous other ***GURPS*** books; translated, edited, or contributed to several German ***Call of Cthulhu*** products; contributed to ***d20 Modern Weapons Locker*** and ***d20 Mecha Military Vehicles;*** and published many articles in American, British, and German gaming magazines. Hans has been an avid gamer since 1983. His non-gaming interests include science fiction, history, cinema, and punk rock. He lives in Berlin.

Chapter One
The Equipment Age

The clerk didn't look up from his paperwork as the trio approached, grunting under their heavy loads. As they placed armloads of gear on the table, he said, "Name. ID. Branch."

The big Inuit dressed in sealskin trousers and a heavy wool sweater stepped forward first. He cleared his throat and replied, "Nat Hunter. 098679-1898HL. Intervention. Special Operations."

"Inventory?" demanded the clerk.

Nat motioned at the pile of weapons. "Winchester Model 1876 carbine in .50-95, Super Redhawk Alaskan, two MK II fragmentation grenades, titanium combat folder."

The clerk looked up and slid a clipboard across the table, between two small mountains of expedition gear, electronics, and body armor. "Are any of you carrying personal weapons on this mission?"

Nat shook his head no and signed the form.

"Next."

The middle-aged man with the eye patch spoke up. "Morton Locke. 098679-1886HL. Penetration. Intelligence." He wore traditional Inuit garb and a fur-trimmed parka, with a pistol belt slung low around his waist.

"And?" the clerk intoned, with more than a slight indication of impatience.

"Auto-Ordnance M1921 with drum, two Colt .38 Super Automatics."

"Next?"

The young blond man unslung his rifle from his shoulder and held it at port arms. "Airk Heimdall. 098679-1901HL. Penetration. Contact." Quickly, he added, "Model 70 in .458 with thermographic sight, cut-down Ithaca Model 37, Beretta 93R, tomahawk."

The clerk finished his paperwork and then motioned toward a set of double doors. "Through those doors; motor pool's on your right."

This chapter presents an overview of the technological timeline covered in ***High-Tech,*** along with some general rules regarding equipment use, availability, and pricing.

Timeline

The most pressing issue the GM must consider regarding equipment is simply "What's available?" Below is a more detailed technological timeline than the one presented on pp. B511-512. For more on specific classes of technology, see the appropriate chapter(s).

TL5: The Industrial Revolution

The Industrial Revolution (on historical Earth, roughly 1730 to 1880) coincides with the first successful steam engine. It becomes self-perpetuating by embracing curiosity-driven innovation and capitalist economics simultaneously, rewarding risk-taking and invention with wealth. Key developments include:

- *Agriculture:* Four-course crop rotation, seed drill.
- *Arms and Armor:* Barbed wire, breech-loading artillery, breech-loading rifle, ironclad warship, mechanical machine gun, nitroglycerine, revolver, rocket.
- *Information Technology:* Newspaper advertising, photography, public library, scientific journals, telegraph.
- *Machinery:* Cotton gin, interchangeable parts, powered loom, reaping machine.
- *Material Science:* Crucible steel, friction match, rubber.
- *Medicine and Health:* Anesthetic, antiseptic, canned foods, evaporated milk, hypodermic syringe, pasteurization, vaccination.
- *Power:* Battery, coal, steam engine.
- *Transportation:* Bicycle, hot-air balloon, macadam road, railroad, screw propeller, steamship, submarine.

TL6: The Mechanized Age

The Mechanized Age (historically, about 1880 to 1940) is the consequence of industrialization sinking its teeth into technologies that are more capital-intensive than labor-intensive and reaping great benefits from the resulting economies of scale. Goods of all types drop in price relative to wages as "modern" transportation and manufacturing techniques hit their stride. Important advances include:

- *Agriculture:* Herbicides, mechanized harvester, pesticides.
- *Arms and Armor:* Aircraft carrier, automatic weapons, battleship, high explosives, military aircraft, poison gas, tank.
- *Information Technology:* Color photography, fingerprint records, motion pictures, radio, sound recording, telephone.
- *Machinery:* Electric light, radar, sonar, vacuum tube.
- *Material Science:* Aluminum, Bakelite, Bessemer steel, synthetic fibers.
- *Medicine and Health:* Blood transfusion, electrocardiograph, inoculation, insulin, penicillin, refrigeration, sterilization, sulfa drugs.
- *Power:* Electric motor, hydroelectric power, internal combustion engine, secondary battery, steam turbine.
- *Transportation:* Airplane, automobile, high-speed road system, primitive helicopter, zeppelin.

TL7: The Nuclear Age

The Nuclear Age dawns with the successful harnessing of nuclear power (in the 1940s, on historical Earth). This occurs alongside such inventions as television, jet engines, and the transistor. The crowning achievement of TL7 technology is in many ways to make good on the promises of TL6. Significant innovations include:

- *Agriculture:* Chemical fertilizer, hybrid crops.
- *Arms and Armor:* Assault rifle, ballistic body armor, guided missile, military helicopter, military jet, nuclear weapons.
- *Information Technology:* Computer, high-speed press, television.
- *Machinery:* Integrated circuits, laser, transistor.
- *Material Science:* Composite materials, plastic, superconductors, titanium.
- *Medicine and Health*: Artificial heart, organ transplants.
- *Power:* Gas turbine, nuclear power, photovoltaic cell.
- *Transportation:* High-speed train, jet aircraft, spacecraft.

TL8: The Digital Age

The Digital Age begins with the commercial success of personal computing – in around 1980, here on Earth. Definitive technologies include:

- *Agriculture:* Genetically engineered crops and pesticides.

Dirty Tech

High technology isn't always manufactured from carbon fiber, packed with microchips, or glistening with chrome and style. Sometimes, a hero is desperate enough to try almost anything. What would MacGyver or the Professor do in a pinch? Can you fashion a battery on a deserted tropical island, or cobble together functional armor from the contents of the high school cafeteria? Maybe you can! This is "dirty tech."

Throughout this book are *Dirty Tech* boxes that contain hasty solutions for hard-up heroes: homemade explosives, field-expedient firearms, jury-rigged electronics, etc. Been aching to use that skill languishing on your character sheet? Wondering why you bothered with that point in Armoury, Chemistry, Electronics Repair, or Machinist? Check out the *Dirty Tech* entries!

- *Arms and Armor:* Bioengineered disease, personal defense weapon, stun gun, unmanned drone.
- *Information Technology:* Desktop publishing, personal computer, Internet.
- *Machinery:* Rapid prototyping.
- *Material Science:* Carbon fiber, fullerenes, microfibers.
- *Medicine and Health:* Artificial fertilization, genetic screening, laser surgery.
- *Power:* Advanced battery, computer-integrated power plant, wind farm.
- *Transportation:* Hybrid car, reusable spacecraft.

Buying Equipment

Most legal equipment is available from shops or catalogs, but getting hold of *expensive* items (in general, articles that cost more than the campaign's average starting wealth; see p. B27) or those that require licenses may involve dealing directly with a manufacturer, authorized dealer, or other specialist. This may be a fast and simple process for expensive-but-commonplace civilian items (e.g., automobiles), but it can take longer to find a specialized item and arrange for its sale – especially if it is valuable to collectors, requires a direct order from the manufacturer, or calls for special paperwork. The GM may require Area Knowledge or Research rolls to find exotic equipment, and/or Administration or Streetwise rolls to acquire it without bureaucratic headaches or shipping delays.

You Get What You Pay For

In real life, people pay exorbitant sums for gear that may or may not offer an advantage. Fads, fashion, peer pressure, and poor research can all steer a shopper down the wrong aisle. In ***GURPS,*** however, the transparent nature of equipment ratings means that the *players* know which items give the best performance – even if their *characters* wouldn't. Players who abuse this knowledge can challenge the GM's efforts to prevent the proliferation of powerful hardware in the campaign.

Luckily, the GM has a number of methods to control vantage shoppers. As in real life, the GM may force buyers to seek high-quality equipment by two equally valid routes: *expert knowledge* and *ludicrous prices.*

Expert Knowledge: An equipment hunter might roll against appropriate skills (e.g., Connoisseur or Expert Skills) or seek guidance from Allies, Contacts, or Patrons. This is similar to the black market (pp. 7-9), but the potential consequences are less severe. Instead of being jailed or kidnapped, the unfortunate buyer is subjected to opinionated windbags, harassed by so-called "experts," or swindled by dishonest shysters. If the required roll fails, assume that the gear is located but is only of normal quality . . . regardless of its price.

Ludicrous Prices: A shopper with more money than good sense can simply *buy* the experience and contacts necessary to assemble superior kit. He might hire the world's foremost experts ("I retained three Nobel Prize-winning scientists to solve this little problem for me."), pay for extensive tests ("I want the entire shield inspected with an atomic force microscope!"), or at TL6+, simply take the brute-force approach ("Hire 100 Indian laborers to hand-make 10 a day apiece until we get a suppressor that rates -22 dB. Junk the rest."). The result is the "best-quality" gear discussed on p. B345. The GM should allow a multi-millionaire who buys the company and has it customize his gear to acquire such equipment with cash alone!

New Perk: Equipment Bond

You own a piece of equipment – or a kit (tool, survival, medical, etc.) – that's uniquely suited to you. When you use it, you have +1 to effective skill regardless of the gear's actual quality. This *is* cumulative with bonus for high-quality equipment.

Like Weapon Bond (p. 250), this isn't a magical enchantment or spiritual attunement. The equipment simply has the perfect level of comfort, fit, balance, and so on. If the gear is lost or destroyed, the Equipment Bond doesn't transfer to new hardware – but you can acquire a new Equipment Bond in play.

Each Equipment Bond is a 1-point perk. You must pay the usual price for the equipment, but you *can* acquire it as Signature Gear (p. B85).

Optionally, the GM may allow Equipment Bond (see above) or Weapon Bond (p. 250) to stand in for "quality" gear for character concepts that don't involve great wealth. This can represent extreme-sports athletes, special-operations soldiers, and others who constantly modify and tinker with gear they've assembled from off-the-shelf components.

The Black Market

An item that's illegal to own – or stolen – may be available from one or more outlets in the underground economy. This is the *black market.*

Availability

Acquiring black-market goods usually requires a Contact (p. B44) who knows how to get in touch with the local underground. To do so, the Contact rolls against his effective Streetwise skill. A PC without a Contact can use his own Streetwise skill to locate new connections. The players specify what they're looking for, and then the GM decides on the item's local availability, applies any modifiers, and rolls in secret.

Modifiers: A penalty equal to the local Control Rating (p. B506); any Cultural Familiarity modifier (p. B23); +1 if the area includes a major shipping port, borders a low-CR country, or has ineffectual (corrupt, undermanned, etc.) law enforcement; -3 in an unfamiliar area (Contacts seldom have this penalty, but PCs often do!).

Failure may result in unwanted attention from local cops or criminal syndicates. Critical failure means the buyers walk into a police "sting" operation, are ambushed by other criminals, or acquire dangerously defective goods!

Markets

The term "black market" describes *all* businesses that operate illegally. They might sell proscribed goods and services, deal in forgeries ("Don't mind the wet ink, officer."), or simply circumvent tax or safety laws to undercut their legitimate competitors. The GM may set up various niches within the black market that cater to specific customers and that require specialized Contacts or skill penalties (see above) to deal with. Examples of specialized black markets include:

Electronics: Supercomputers (prototype or custom-made) and banned software ("Guaranteed to break the intrusion countermeasures on that military mainframe . . . but owning it will get you 20. Still want it?"). Failure means that the product you bought doesn't work as advertised or is a fake. Critical failure means that very angry people know exactly where you are ("Who's knocking at the door?").

Medical: Cut-rate surgical procedures ("Dr. Pain will see you now . . ."), unlicensed (but cheap!) clinics, stolen organs (with the previous owner still attached), and prescriptions and permits for drugs ("Works just like Viagra, except that it causes cancer in lab mice."). Failure means you don't find what you're looking for, or the seller can't provide the amount requested. Critical failure means you leave with scars, placebos, or an angry amputee on your trail.

Combat Gear: Military vehicles ("Chinese copy of the T-55 tank, fresh from the factory."), undocumented firearms (the fall from the truck erased their serial numbers), and body armor (with a minimum of unpatched bullet holes). Failure means you can only get an inferior version of what you're looking for. Critical failure means hardware that blows up in your face on first use or that's being tracked.

Prices

The black market operates in competition with the legitimate market for many goods. To sell items that are readily available through legal channels, it can only compete by making them easier to acquire (which is rare) or by selling them at lower prices (by not charging taxes, unloading cheap copies, or fencing stolen goods). Easily copied media and textiles can sell for as little as 5% of the usual price. Almost everything else sells for around 60% of full price.

The black market is opportunistic. If an item is hard to acquire legally, dealers will ruthlessly exploit their edge over the legitimate market. Successful haggling with the Merchant skill can bring the price down – but black-market dealers rarely have any incentive to offer discounts!

Legality and Antiques

The GM may choose to make obsolete weapons – and, optionally, other antiques – available at an increased Legality Class. For every two *full* tech levels by which a device is obsolete, increase its LC by one, to a maximum of two over its starting LC. On reaching LC4, there are no controls at all on the item. Of course, the LC of some things won't rise with TL; in particular, chemical, biological, and nuclear weapons are *always* likely to be tightly controlled.

Example: Deputy Marshal Rufus Kingsland, banestorm victim, grinned as he rubbed the gleaming brass of the Gatling Model 1874 displayed in the gunshop window. Despite the motorized carriages that clogged the streets of a strangely unfamiliar Amarillo, Texas, he found himself still wishing that his battery had gone up the Rosebud with Custer instead of being left in the rear with Terry. No matter now. He had a score to settle with a Cheyenne devil. He sidled up to the counter, tipped his hat to the youngster with the spiky blue hair, and said, "How much for that there coffee mill gun?"

At Kingsland's original TL5, a Gatling gun is LC2. But in 1985, three TLs later, it has been obsolete for well over a century! As such, the weapon – or an exact replica, even if made at TL8 – has its LC increased by 1, making it LC3.

After signing some papers and parting with a pocketful of gold Double Eagles to grease the transaction, Kingsland managed to get gun, tripod, and ammunition strapped onto the mules he'd bought at that new-fangled stockyard. He saddled his old roan and led the mule train down 6th Street, passing by lines of beeping carriages. It was time to break out into the badlands and track down that *brujo* . . .

Local availability and demand are major factors in the final price. A war-torn country may have an abundance of LC1 military weapons that desperate locals will happily sell for a huge discount to anyone with hard currency . . . while electronics and food have outrageous markups. A rich, peaceful country may have a thriving black market in cheap alcohol and pirated movies, but LC0-3 weapons might not be available at *any* price.

Gray Markets

"Gray markets" are pseudo-legal means of acquiring controlled – or at least questionable – goods. Private citizens who sell one another legal weapons for cash can create a steady gray market in unregistered weapons. A legally prescribed drug can generate a gray market if resold without a prescription. A thriving gray market in body armor may exist because a company refuses to sell its product to civilians, even though they may legally possess it, but does business with police and security personnel without a rigorous ID check.

Gray-market goods are easier to find. Roll as above, but at +3 to skill. As well, the GM should assess far less severe penalties for failure.

Outlawed Goods

Outlawed (LC0) goods are those banned by governments that are willing and able to enforce a strict ban. Historically, nuclear, chemical, and biological weapons have been outlawed. A civilian looking to purchase a nerve-gas shell, a tactical nuke, or a weaponized strain of Ebola virus probably won't have much luck.

Locating outlawed goods is best handled as an adventure. Failure can mean anything from kidnapped loved ones ("Deliver the package or we kill the girl.") to imprisonment ("Two men were arrested today in a police raid on a warehouse in . . ."") or death ("The *Solsnetskaya* do not appreciate your incompetent business practices.").

Wear and Care

This section expands on the rules for maintenance, breakdowns, and repairs on pp. B483-485.

Maintaining Gadgets

Complex TL5-8 equipment – especially *electronic* equipment – is sensitive to harsh conditions. Missed or failed maintenance checks (p. B485) can reduce HT; continued abuse will eventually mean a breakdown that requires repairs (p. B484). Rough environments can also cause breakdowns; see *Slime, Sand, and Equipment Failure* (p. B485). Cheaply made equipment suffers greatly in such circumstances. "You get what you pay for" is never truer than when shoddy gear is used under field conditions!

The simplest objects rarely require much maintenance. If an item costs less than 0.1% of average starting wealth ($5 at TL5, $10 at TL6, $15 at TL7, or $20 at TL8), the GM may assume that it's so simple that the rules for maintenance and breakdowns don't apply. If the GM feels that malfunction is possible, though, then even the cheapest device – especially if it's also *cheap* (p. 10) – isn't exempt. A water tester might cost only $20 at TL8 (see *TDS Tester,* p. 50), but it could give a false reading, resulting in the PCs consuming tainted water. Maintenance checks and HT rolls for failure should *always* apply to complex items or those regularly placed under stress.

Ultimately, the GM should use common sense and dramatic license to decide whether a given item is subject to maintenance checks and HT rolls. The GM is encouraged to waive those rules when they would needlessly bog down play . . . and then enforce them ruthlessly in dramatic situations, such as when the PCs are cut off from a source of spare parts! The GM should also enforce them in campaigns that focus on firefighters, ambulance crews, and professional soldiers. In real life, such specialists spend much of their time checking and maintaining their tools. Weapons, life-saving equipment, scuba gear, medical kits, and even rope are *always* checked after each use, carefully cleaned, and stored for the next time.

Repairing Gadgets

If a gadget breaks down, it will need minor or even major repairs (see *Repairs,* p. B484). Repairs require rolls against a suitable repair skill: Armoury (p. B178) for weapons and defenses; Computer Operation (p. B184) for software; Electrician (p. B189) for consumer appliances, such as hair dryers; Electronics Repair (p. B190) for electronic devices; Machinist (p. B206) for tools; Mechanic (p. B207) for power plants and vehicles; and Sewing (p. B219) for fabric other than body armor. At the GM's option, fixing a complex system might involve *several* skills, depending on what broke down.

Repairs also require appropriate tools; see *Tool Kits* (p. 24). Major repairs call for a substantial investment in parts, too. If tools or parts are absent, the Machinist skill can be used to fabricate them.

Powering Gadgets

For a gadget that requires power to work, running out of batteries or fuel can be as crippling as a breakdown. The only way to solve this problem is to find a power source! For details, see *Cost, Weight, Power, LC* (pp. 10-11) and *Power* (pp. 13-16).

Integrating and Modifying Equipment

Equipment quality is discussed on p. B345. In addition to those cost and skill modifiers, the following features can be added to just about any gadget for which both cost and weight are given (*not* software, drugs, etc.). Multiple modifications are possible ("expensive" and "styling" commonly occur together); multiply cost factors together, and do the same for weight factors.

Disguised

A gadget or a weapon may be disguised as something else of similar shape; e.g., a knife built into a belt buckle, or a Geiger counter that looks like a cellular phone. Finding the hidden item requires the Search skill. Cost is ×2 for a mass-produced disguised item, ×5 for a custom-built one.

Styling

Any device can have a more fashionable appearance thanks to inlaid jewels, hand-tooled leather, embroidery, brocade work, silver or gold plate, etc. This is common for presentation-grade weapons. Styling grants a bonus to reaction rolls from collectors and potential buyers, and to Merchant skill rolls made as Influence rolls (p. B359) on such people: +1 costs ×2, +2 costs ×5, and +3 costs ×10.

Rugged

A "ruggedized" gadget is built to withstand abuse, harsh weather, and damage. It has a shockproof and/or waterproof case, heavy-duty cables (for power, data, etc.), shatterproof lenses, and so on that give +2 to HT and *double* normal DR. Cost is ×2. Weight is ×1.2. This option isn't available for clothing, weapons, or armor.

Cheap and Expensive Gadgets

Cheap gadgets use inexpensive materials, older electronics, etc. They're either clunky (weight, excluding that of batteries, is ×1.5) *or* more fragile and finicky (weight is unchanged, but apply -2 to HT and *halve* DR). Either way, cost is ×1/2.

Expensive gadgets are made of lighter, stronger materials. Cost is ×2. Weight (excluding that of batteries) is ×2/3.

Neither option is available for clothing, weapons, or armor.

Combination Gadgets

Want to invent a device featuring a GPS, a PDA, and a thermograph in one handy unit? Here's how.

Cost and Weight: Starting with the costs and weights of the component gadgets, do the following:

- If *all* of the gadgets can be used at once, *weight* is that of the heaviest gadget plus 80% of the weight of the others (weight savings being due primarily to shared housing). *Cost* is that of the costliest gadget plus 80% of the cost of the others.
- If only *one* gadget works at a time, *weight* is that of the heaviest gadget plus 50% of the weight of the others (due to shared electronics and mechanical parts). *Cost* is that of the costliest gadget plus 50% of the cost of the others.

Weight calculations use the gadgets' *empty* weight, after subtracting the weight of batteries and/or ammunition.

Power: Combination gadgets often end up using several different batteries. To make them all run off the same size of battery, adjust endurance in proportion to the relative *weight* of battery sizes; e.g., an S battery is 3.3 times as heavy as an XS battery, so a gadget that switched from the latter to the former would operate for 3.3 times as long. Remember that changing battery type will modify final weight: subtract the weight of the old battery and add the weight of the new one.

LC: A combination gadget shares the LC of the component with the *lowest* LC.

Adjusting for SM

Clothing, life-support gear, and similar personal items assume a user the size of a normal, adult human (SM 0). When buying equipment for larger or smaller individuals, multiply *cost, weight,* and *power requirement* by a factor that depends on the user's Size Modifier:

SM	*Factor*	*SM*	*Factor*
SM -4	×1/20	SM +4	×20
SM -3	×1/10	SM +5	×50
SM -2	×1/5	SM +6	×100
SM -1	×1/2	SM +7	×200
SM +1	×2	SM +8	×500
SM +2	×5	SM +9	×1,000
SM +3	×10	SM +10	×2,000

Equipment Statistics

The following terminology and statistics are used to describe the equipment in later chapters.

TL (Tech Level)

Each gadget's tech level appears in parentheses after its name; e.g., "Flashlight (TL6)." This is the TL at which the item can be reliably manufactured at the listed cost. For ***High-Tech,*** this implies one or more of interchangeable parts, assembly-line production, modern machinery, alloy or plastic construction, and computer-aided design. A knife might be a TL0 invention, but a *TL8* knife is a very different beast! However, the exceptions explained in *Variations Within a TL* (p. B511) often apply – and note that it's extremely common for gadgets to be used and even improved at higher TLs, long after they're introduced.

Cost, Weight, Power, LC

Many gadgets list cost, weight, power, and LC at the end of their description; e.g., "$20,000, 20 lbs., S/12 hr. LC4."

Cost

This is the gadget's price in generic ***GURPS*** "$" (see *Tech Level and Starting Wealth,* p. B27). It *doesn't* include batteries, fuel, or ammunition. Newly introduced technology is often very expensive. Relatively recent hardware in used condition sells for 50-80% of the new price, but may not be in perfect shape; roll against operation skill to spot problems. Older but not-yet-obsolete hardware in new condition sells for 10% or even 1% of the original price. In either case, the GM sets the actual price.

Weight

This is the gadget's weight under Earth-normal gravity (1G), given in pounds (lbs.) or in some cases in tons

(1 ton = 2,000 lbs.). Weight *does* include batteries, fuel, and/or ammunition, except where noted. Items listed as having "negligible" ("neg.") weight aren't truly weightless; assume that 20 to 50 such items weigh 1 lb.

Power

High-Tech uses a code to provide information about the number and type of generic batteries required by portable, power-using devices. The more power such a gadget consumes, the larger the battery needed. For the costs, weights, and letter codes associated with batteries, see *Batteries* (p. 13).

If a non-weapon gadget runs on batteries, its description lists the letter code for the battery type it uses – preceded by the number of batteries, if it needs more than one. This is followed by a slash and then an operating time, usually in hours (hr.), days, or weeks (wk.). For instance, "2×S/12 hr." means that two small (S) batteries power the device for 12 hours of continuous use, while "2×T/3 days" means two tiny (T) batteries power the gadget for three full days. In some cases, endurance is given in "uses" or "shots" instead.

Some powered devices are normally plugged into a building's electrical system, built into a vehicle, etc., instead. These use the notation "external power." Where it's likely to matter, the exact power requirement in kilowatts (kW) appears. Other alternatives to batteries (e.g., solar power) are covered in Chapter 2.

LC (Legality Class)

Legality Class rates how likely the item is to be legally or socially controlled. If LC is omitted, this means the device is unlikely to be controlled by even the most repressive of regimes. For details, see pp. B267, B507.

Other Statistics

Where appropriate, other statistics may appear – notably volume in cubic feet. When in doubt, check the *Glossary* (pp. 245-246).

Specialized Equipment

Certain items are described in a different format from that used for most gadgets:

Armor, Suits, and Protective Gear: These use the statistics defined on p. B282.

Software: A computer program has a Complexity rating, which is the minimum Complexity of a computer that can run it; see *Software* (p. B472).

Vehicles: These use the statistics explained on pp. B462-463.

Weapons: These use the statistics described on pp. B268-271.

Equipment Bonuses

High-Tech includes examples of equipment from every quality grade defined in *Equipment Modifiers* (p. B345). In item descriptions, any skill bonus for a gadget's quality is followed by "(quality)"; e.g., "provides a +2 (quality) bonus to Armoury skill." Quality is *basic* if there's no bonus; *good* if the bonus is +1; *fine* if at least +2 but less than +TL/2; and *best* if +TL/2. Higher-quality equipment is *generally* heavier and more expensive.

A gadget may also give a skill bonus because the underlying technology is easy to use or realistically doesn't fail very often. An example is the bonus for high-TL surgical instruments (see p. B424). Such a modifier is comparable to a ranged weapon's Accuracy. Any bonus *not* marked "(quality)" is an "intrinsic" bonus like this. It has nothing to do with quality; it applies whenever you use that article of equipment.

Quality bonuses, intrinsic bonuses, and the +1 for Equipment Bond (p. 7) *are* cumulative.

Tech-Level Specialization

Characters must learn technological skills at a specific TL. IQ-based skills suffer hefty penalties when used at any other TL, while skills based on attributes other than IQ get smaller penalties; see *Tech-Level Modifiers* (p. B168). Equipment from another TL will likely be unfamiliar, too, unless it's an improved or obsolete version of something with which the hero is already familiar; see *Familiarity* (p. B169).

In reality, while technologies do sometimes change rapidly, mature ones can remain stable for a long time. As an optional rule, the GM may treat a TL penalty for a *DX-based* skill as if it were an unfamiliarity penalty rather than a default penalty for a different-TL version of the skill. This exemption doesn't extend to other skills, or even to IQ-based rolls for DX-based skills!

Example: After days of running from the bloodthirsty tribe of Amazonian cannibals he'd been investigating, Morton Locke emerges from the jungle and stumbles onto the banks of the Rio da Dúvida, where he finds a dugout canoe. Paddling a TL0 canoe with Boating/TL6 (Unpowered) would usually give a whopping -6 to skill. However, the GM rules that a canoe is a canoe, and that this is merely an issue of familiarity. After a frustrating day spent learning the dugout's intricacies and limitations – and frequent looks over his shoulder – Locke operates it at no penalty.

HP, HT, DR

HP: Calculate a gadget's HP from its weight. Use the table on p. B558. Almost all gadgets use the Unliving/Machine column.

HT: Assume that a gadget has HT 10 unless otherwise noted. *Ruggedized* (p. 10) gear is HT 12; some *cheap* (p. 10) items are HT 8. The +1 or +2 bonus for *good* or *fine* quality also adds to HT. The HT bonuses for ruggedized and quality equipment are additive; a rugged, fine radio would have HT 14.

DR: Use the guidelines on p. B483. Most gadgets are made of plastic, wood, or thin metal with DR 2. Weapons are normally DR 4 – or DR 6 for solid-metal melee weapons. Armor, suits, vehicles, etc., have their specified DR. Ruggedized gadgets have twice their normal DR.

Chapter Two
Core Technologies

Locke flipped on the tablet computer as Nat and Airk loaded the HMMWV. The vehicle looked roomy enough from the outside, but there was precious little space remaining inside after the parachronics had been shoehorned in.

"Says here that 36+30 has been inactive for a while, now. Scouts report a single outpost of Centran personnel," Locke said.

Airk tossed the last gear bag onto a cargo shelf in the vehicle. "Simple op then: pop in, snatch this Centrum intelligence officer, and then pop back out."

"Not so simple," growled Nat. "It's nuclear winter there. When Mt. Tambora blew up in their 1815, it caused a massive chain reaction of volcano eruptions. The dust thrown up into the sky killed off most of the population."

Nat slid a second container of alcohol for the fuel cell into the HMMWV and continued. "Good news is the scouts say the dust is beginning to settle. In a few decades, it might make a good colony."

Airk shrugged, and strapped on his pistol belt. "Still sounds simple."

Nat and Locke exchanged looks. Ops were never simple . . .

Virtually every technological civilization is founded on two basic building blocks: *power* and *information technology.*

Power

In the spring of 2003, at the height of the Iraq War, the U.S. military machine almost lurched to a stop. A terrible and unforeseen crisis gripped combat units from Basra to Baghdad: they were running out of BA5590, military-speak for the principal radio battery in use with U.S. forces. Without BA5590s, units would go offline, one by one, and back to the days of General Custer.

The problem was caused by a number of logistics snafus. Ships full of BA5590s were steaming toward Iraq, but the war kicked off while the ships were days from port. Meanwhile, frontline soldiers were throwing away batteries half-used rather than fully draining them, in an effort to keep their equipment topped up at all times. Each combat division was using over 3,000 batteries a day – three or four times the predicted rate! It took several weeks of round-the-clock shifts at stateside battery plants – and a lot of creative borrowing from other U.S. units around the globe – before the crisis fully abated.

The lesson is simple: High-tech gadgetry can be a wonderful advantage, the linchpin in the heroes' plan . . . but the best encrypted cellular phone or latest palmtop computer is just an expensive paperweight without power.

Batteries

Benjamin Franklin coined the term "battery," comparing an array of glass jars that discharged static electricity on command to a battery of cannons. Franklin's beloved Leyden jars were actually capacitors, however. Alessandro Volta's voltaic pile was the first "wet cell" – a true battery.

At TL5, batteries are low-capacity curiosities, suitable primarily for stationary work. Most are used in telegraphy. For instance, the Transatlantic Telegraph – completed in 1866 – required 800 primitive batteries to push the signal 1,700 miles across the North Atlantic (such a bank of batteries would make an excellent source of power for a parachronic conveyor!). Batteries have improved steadily, becoming more portable and rugged with each passing tech level.

Portable electric power is extremely useful for heroes on the move, but batteries have many problems. For one thing, they slowly lose their energy while in storage. Some rechargeable cells retain a full charge for less than a month – although the best TL8 versions hold a serviceable charge after years on the shelf. Rechargeables also have a limited number of recharge cycles, a few dozen to a few hundred at best. As well, batteries lose energy *quickly* in freezing temperatures, and have perhaps half their normal endurance in warmer temperatures. When hot, they may explode, spewing acid everywhere. Adventurers can try to offset these risks by carrying spare cells . . . but there's always the *possibility* of a power outage when using batteries.

Battery Size

Batteries vary greatly in capacity and weight – a comprehensive "battery table" would fill volumes! For simplicity, ***High-Tech*** uses a few *generic* battery sizes that approximate those in the real world. To simulate a particular real-world gadget, use batteries one size smaller than that listed for the generic device, take enough of them to approximate actual battery weight, and then adjust endurance in proportion to total weight.

Below, battery abbreviations appear in parentheses: T, XS, S, M, etc. Note that some devices use multiple batteries; e.g., 3×S. All prices assume non-rechargeable cells. Rechargeables (lead-acid, nickel-metal hydride, lithium polymer, etc.) cost at least 5× as much but can be recharged dozens of times.

Tiny (T). A button- or coin-sized battery for watches, mini-flashlights, hearing aids, laser sights, tiny bugs, etc. $0.25, 0.02 lb. (50 weigh 1 lb.). LC4.

Extra-Small (XS). A battery used in such portable consumer electronics as audio recorders, CD/MP3 players, digital cameras, and night-vision goggles. Similar to a 9-volt or AA battery. $0.50, 0.1 lb. LC4.

Small (S). A standard battery for flashlights, portable radios, or cellular phones. Similar to a D-cell or C-cell battery. $1, 0.33 lb. LC4.

Medium (M). A common power source for lanterns or squad-level radios. More expensive rechargeable models are used in laptops, video cameras, and the like. $5, 2 lbs. LC4.

Large (L). A lunchbox-sized battery. At TL5, it's used in telegraph stations. At TL6+, rechargeables are found in small vehicles (such as ATVs, motorcycles, and snowmobiles), base-camp radios, and the like. $10, 10 lbs. LC4.

Very Large (VL). A toolbox-sized battery found in cars, trucks, golf carts, etc. It can power radios or other heavy-duty electronics for extended periods. A bank of these is often used for external power. $20, 50 lbs. LC4.

Dirty Tech: Batteries

High-tech travelers stranded in a low-tech area can cobble together a useful battery with a little ingenuity. Every grade-school kid has built a primitive battery out of his favorite fruit or vegetable. A voltaic pile, one of the earliest batteries, can be made by stacking dissimilar metal coins or discs together, separated by brine-soaked cloth. Such a simple pile can produce enough voltage to power a small crystal-radio receiver.

Batteries with more kick take more effort. Vinegar or citrus juice can be used as the acid. Nearly any two metals can serve as electrodes – iron or lead sheeting, discarded aluminum foil, etc. A small jar of acid with metal electrodes can produce a useful amount of electricity. Several jars wired in series can power a small electronic device.

Dead or damaged batteries can be useful for raw materials. A standard automobile battery contains around 20 lbs. of lead (useful for bullet-making, p. 163) and 5 lbs. of sulfuric acid (just the thing for home-made explosives, p. 186).

Inverters and Adapters

Many large items are described as using *external power.* They're designed to be plugged into building or vehicle power, a generator, etc. They operate for as long as power is available.

An *inverter* lets such a device run off batteries. It requires at least an M battery, which will last from a few minutes to a few days, depending on the device. An L or VL battery lasts proportionately longer. Cost and weight for an inverter match those of the batteries it adapts.

Likewise, a battery-operated device can have a *power adapter* for the cost and weight of its usual batteries. This lets it run off external power instead of batteries.

GENERATORS

Generators provide "external power" . . . while their fuel holds out. Explorers, military units, and similar expeditions use them for base camps; others use them to power cabins. They can also provide backup power for everything from hospitals to shopping malls. Below, generators are divided into two types:

Portable: Usually provides enough external power (about 1-2 kW) to keep a few small devices going at once; e.g., a computer, a TV, and a few lights.

Semi-Portable: Typically supplies external power to a whole household, workshop, or equivalent (approximately 5-10 kW).

Steam Power (TL5)

The first steam engines in wide use were the Newcomen "atmospheric engines" of the 1690s: low-powered, stationary installations used primarily to drive mine pumps. From about 1770 to 1800, James Watt's patents controlled steam-engine manufacture in England. Watt favored low-pressure setups . . . which were also mostly suited to stationary applications. The firm of Boulton & Watt built more than 400 engines in those years. They were used to power pumps, machine tools, and industrial machinery, and as traction engines. Real development of the steam engine for transport began after 1800.

Semi-Portable Steam Engine (TL5). A steam engine mounted on iron-shod wheels and pulled from one worksite to the next by draft horses. It was a common sight on well-to-do farms from England to Alabama starting in the 1820s, and would likely have powered Babbage's Difference Engine, had it been built. A typical model – trimmed in polished brass and painted in bright colors – consumes 250 lbs. of wood and 50 gallons of water per hour. A leather belt links it to various steam-powered tools (p. 27). $15,000, 4 tons. LC4.

Portable Steam-Powered Generator (TL6). This is one of the smallest steam engines – the plaything of a retired railroad man. It looks like a small heating stove, but has the built-in equipment necessary to generate a small amount of electricity. Some were used as bench-top power plants, powering lathes and saws in areas without electricity. A stove-engine this size was pressed into action as a clandestine generator for radios during WWII by Britain's Special Operations Executive. It burns 20 lbs. of wood (or 5 lbs. of coal) and uses 1 gallon of water per hour. $250, 50 lbs. LC4.

Semi-Portable Homemade Steam Generator (TL7). This can be cobbled together from junk scavenged from city ruins. Roll against Scrounging +4 to find the parts in all but the most devastated cities; roll against Machinist or Mechanic (Steam Engine) to assemble it. It consumes 80 lbs. of wood and uses 5 gallons of water per hour. It converts the steam directly into electricity. Loud, ugly, and prone to malfunctions, it may be the only electrical generator available in a post-apocalypse setting. $250, 600 lbs. LC4.

Internal Combustion Engines (TL6)

At the turn of the last century, Sears, Roebuck and Company sold a primitive gasoline generator by mail order. A noisy belt-driven contraption, it spurted smoke and oil, and broke down frequently. By contrast, modern versions are whisper-quiet and small enough to fit in a large backpack. Both provide external power for a dozen or so items.

Semi-Portable Gasoline Generator (TL6). An early model gasoline generator, circa 1900. The 1-gallon tank lasts for about 3 hours. $600, 125 lbs. LC4.

Portable Gasoline Generator (TL7). The 1-gallon fuel tank lasts for 10 hours. Weight is ×2/3 at TL8. $600, 50 lbs. LC4.

Mechanical Generators (TL6)

Throughout history, man has been his own best engine, capable of generating over 300 watts for hours at a time. All of the generators below convert mechanical energy provided by a human into electricity. The operator expends 1 FP an hour and the device produces electricity. As a rough estimate, assume it takes 1 hour to recharge 10 lbs. of batteries.

Portable Muscle-Powered Generator (TL6). From WWI to Vietnam, military units carried hand-crank generators to recharge radio batteries. This generator provides external power to one device, or can recharge a battery. $50, 10 lbs. LC4.

Semi-Portable Muscle-Powered Generator (TL6). This is a larger, bicycle-type generator that might be found in an "off-the-grid" cabin. It works like the generator above but can provide external power to two or three devices at once (e.g., a TV, a laptop, and a small refrigerator). A successful Machinist roll can build this system in a couple of hours; it requires simple hand tools and some creative scrounging (and a bike, of course; see p. 230). $125, 50 lbs. LC4.

Miniature Muscle-Powered Generator (TL8). A palm-sized generator, this can power only small electronic gadgets (cellular phone, GPS, PDA, MP3 player, etc.). Two minutes of cranking provide five minutes of operating time for such a device; in normal use, it *doesn't* fatigue the operator. It has a built-in flashlight (pp. 51-52) with a 5-hour internal battery, and folds flat to fit in a pocket when not in use. $100, 0.25 lb. LC4.

Fuel Cells (TL8)

Fuel cells use an electrochemical process to convert chemical energy directly into electricity, making them more like an engine than a battery. One advantage of fuel cells over more conventional generators is that they can operate indoors with less noise and no harmful emissions.

Portable Methanol Fuel Cell (TL8). A suitcase-sized generator. It uses 1 gallon of methanol every 3 days. $5,000, 13 lbs. LC4.

Semi-Portable Hydrogen Fuel Cell (TL8). A large cart capable of powering a whole household on a single hydrogen cylinder for 5 hours (extra cylinders are $100, 65 lbs.). $6,000, 100 lbs. LC4.

Energy Collectors

Energy collectors gather energy from natural sources. Man has used solar power since prehistory to preserve herbs, vegetables, and meat by drying them in the sun. Today, major installations may use hydroelectric, solar, or geothermal power, but solar power is the most common means of *portable* energy collection.

Windmills (TL5)

In the 19th century (TL5), many farms in windy areas used windmills. They were common in the U.S. Midwest and Great Plains to pump water from deep wells into holding tanks or ponds. At TL6+, a windmill or wind turbine produces electrical power; in a good windy site, it can provide external power to a small household or workshop. Of course, it provides *no* power on calm days! $10,000, 500 lbs. LC4.

Hydroelectricity (TL6)

At TL5, waterwheels simply provide mechanical energy to drive millstones, saw blades, trip hammers, bellows, etc. At TL6, however, hydroelectric plants begin to convert mechanical energy into electricity. At TL8, a waterwheel or a small water-powered turbine can provide external power to a single household in an area with a fast-flowing, year-round water source; a small hydroelectric turbine suitable for the purpose is $10,000, 250 lbs. LC4.

Alcohol Still

An alcohol still that can fit in a garage or the bed of a pickup truck takes about 30 man-hours to build. Major requirements are a suitable container for the mash (such as a 50-gallon drum) and the various pipes and fittings. Construction requires a successful roll against Chemistry, Machinist, or Professional Skill (Distiller). Cost is $200 – but a successful Scrounging roll could drop this to $20 or less. The completed still weighs less than 50 lbs. empty, around 500 lbs. full of mash. Legality Class varies, depending on the local view of alcohol consumption.

Corn is probably the survivalist's best choice for alcohol production. A bushel of unshelled corn (70 lbs.) produces a bushel of corn kernels (56 lbs.) and 14 lbs. of cobs. The dried cobs can be burned to provide the heat needed to turn the corn mash into alcohol – or they can be fed to livestock. The mash left over from the distillation process (18 lbs.) is a high-quality feed for livestock, and even fit (but unpalatable) for human consumption. A still like the one above can produce 3 gallons of alcohol fuel in three days from a bushel of corn. A whole *acre* of corn will yield over 200 gallons!

Solar Panels (TL7)

Solar panels convert sunlight into electricity. They might power homes here on Earth . . . or satellites and robots on distant planets. Current panels are made of layers of plastics, and are strong, lightweight, and flexible. They can even be incorporated into such items as roofing shingles. They provide power only in sunlight, however. In any environment dim enough to give even a -1 Vision penalty, they produce *no* power.

Solar Power Array (TL7). A large array of solar panels capable of providing external power to a whole household. It covers a sizable portion of the roof of a family sized dwelling. $25,000, 1,200 lbs. LC4.

Solar Powered-Battery Recharger (TL8). This flexible, portable solar panel can be rolled up like a tarp and stuffed in a backpack. In good sunlight, it can power a hand-held device or recharge a handful of batteries in a few hours. $100, 2 lbs. LC4.

Fuel

Even the most efficient engine is useless without *fuel.* Fuel is a vital part of TL5-8 civilian and military logistics. Finding a fuel source – or defending one – can be an adventure all on its own!

Wood (TL0)

Wood as fuel is customarily measured by the *cord:* a pile of wood weighing 1-2 tons. Wood has the advantage of being a sustainable fuel; an acre of average forest produces about a cord per year. A household in even the coldest of climes needs no more than 20 cords a year. Homes in more temperate areas may use as little as 3-6 cords a winter.

A cord of wood costs $50-$200, depending on the type of wood and whether it's seasoned (drying since the previous cutting season) or green (newly chopped). Since a full day's work with a good axe can produce a cord of firewood – felled, cut, split, and stacked – a cord of wood is the price of a day's pay for an unskilled laborer in most settings. At higher TLs, a chainsaw and hydraulic splitter can work 10 times as fast!

Wood (TL0). Per cord. $50-$200, 1-2 tons.

Alcohol (TL5)

Ethanol is an alcohol distilled from various food crops. It's an advantageous choice for frontiersmen, survivalists, and other independent types – a farmer can raise something to eat and use some of it to distill fuel for his tractor. Ethanol is also a disinfectant, a painkiller, and a cleaning agent. Perhaps best of all, it has its traditional recreational use . . . George Washington's Mount Vernon distillery produced over 11,000 gallons of rye whiskey a year until it burned down in 1814.

Alcohol must be of at least 80% purity to burn as fuel. Of recreational alcohols, only a few hard liquors are useful as fuel: certain whiskey and rum, and pure grain alcohol (sometimes called "white lighting" or "moonshine"). Wine and beer, at less than 15% alcohol, *won't* burn. Fuel isn't always suitable for consumption, either; notably, commercial "denatured alcohol" is ethanol with chemicals added to make it poisonous so that people won't drink it!

The efficiency of alcohol production depends on the crop. A bushel of wheat (60 lbs.) or corn (56 lbs.) produces about 2.5 gallons of alcohol; a bushel of potatoes (60 lbs.), only 0.5 gallon.

Alcohol (TL5). Per gallon. $1.30, 6.8 lbs. LC4.

Hydrocarbon Fuels (TL5)

Crude oil – or *petroleum* – is what becomes of dead organisms after millions of years under tremendous heat and pressure. Often portrayed in fiction as a thick, black liquid, petroleum can actually be thin and clear, and may have a red or green tint. To locate oil, use the Prospecting skill.

A party of prospectors can find plenty of adventure at any TL. At TL5, locating oil mostly involves looking for a "seep" – or surface oil – and then digging a well. (Early well-diggers in Pennsylvania during the first "oil rush" charged by the foot and contracted with several companies.) Small-time diggers, called "wildcatters," strike out looking for oil on their own, and sometimes find it. The search for oil is likely to take adventurers to remote or uncivilized areas.

> *I saw a man in trouble and I brought him in. And now I just want to get out of here. Give me my gas.*
>
> *– "Mad" Max Rockatansky,* ***The Road Warrior***

Things are no less complicated for modern geologists and oil developers. In the Middle East, Asia, and South America, they face violence and intrigue; indeed, oil companies routinely hire ex-special forces soldiers for security and hostage rescue. With corporate jets, helicopters, large ships, and offshore drilling rigs in far-flung places, an oil company would be an excellent Patron in a modern-day globetrotting campaign.

An adventure could *start* with finding oil, too. A well that strikes oil sometimes catches fire, and "hellfighters" might be brought in to put it out – most often using explosives. In the 1991 Gulf War, hellfighters from all over the world, including Texas and Russia, battled Kuwaiti oil-well fires in the wake of Saddam Hussein's "Mother of All Battles." The initial prediction was that snuffing all 600 fires would take three years. The hellfighters finished the job in nine months . . . while dodging roaming Iraqi soldiers, unexploded mines and bombs, and sandstorms.

Once you have crude, you need to refine it. The chief constituents of petroleum are *hydrocarbons* – a class of compounds composed only of hydrogen and carbon. Various petroleum products are characterized by the length of their hydrocarbon chains. Since their boiling point increases with the size of the molecule, they can be separated by boiling. This process is called *straight-run refining* or *fractional distillation.*

In fractional distillation, crude is heated with steam to over 1,100°F and fed into a tower that traps the various products at different levels as they boil and rise. Near the bottom of the tower is diesel oil. Above that – and moving up the tower – are diesel fuel, kerosene, gasoline, and naphtha. At the top, gases such as methane and butane are captured.

These products are frequently reformed, cracked, coked, or otherwise altered in separate processes elsewhere in the refinery. At late TL6, catalysts can convert one type of product into another (typically to produce gasoline). At TL7+, increasingly sophisticated chemical additives are introduced to improve engine performance and reduce emissions.

Petroleum and its products are customarily measured in 42-gallon barrels. A TL5 refinery produces 50-80 barrels of kerosene a day. A TL8 refinery produces 100,000 barrels or more a day, about half of that as gasoline.

Crude is stored in above- or below-ground tanks of several thousand gallons – or in underground salt domes created by pumping water in to dissolve the salt, and then pumping it out while pumping in *millions* of barrels of oil (a barrel of crude weighs 303 lbs.). In a post-apocalyptic setting, such an oil-storage site would be a tremendous find!

Diesel Fuel (TL6). Per gallon. $1.25, 6 lbs. LC4.
Gasoline (TL6). Per gallon. $1.50, 6 lbs. LC4.
Kerosene (TL6). Per gallon. $1.50, 6.5 lbs. LC4.

Dirty Tech: Oil Refining

Early oil refineries produced kerosene simply by boiling crude oil in a large iron box and tapping the exhaust stack at the appropriate height to draw off the kerosene. A dirty-tech refinery like this could fit in the back of a pickup truck and would produce 30-50 gallons of kerosene a day. Versions the size of a small house could (and did) produce *hundreds* of gallons of usable fuel a day.

Since kerosene boils at 700°F, the crude itself can be burned to provide the necessary heat. Efficiency is well under 10% – that is, 100 gallons of crude *might* produce 10 gallons of kerosene.

There may also be other problems. The raw petroleum, heavy smoke, and noxious vapors in the vicinity of the stack count as a toxic atmosphere (see *Hazardous Atmospheres,* p. B429). In certain settings, the giant black plume coming from such a ramshackle refinery might attract the wrong kind of attention!

Kerosene produced in a dirty-tech refinery *will* burn in a modern internal combustion engine. The absence of modern additives reduces efficiency and engine life, however. Assume that fuel consumption is 30% higher and maintenance requirements are at least three times normal.

Information Technology

The power of words and ideas differs from that of the mysterious energy locked within an atomic nucleus or that of solar photons striking a photovoltaic cell . . . but it can be mighty indeed. "Information technology" encompasses the numerous ways to store, project, and exhibit that power – from carbon paper to the Internet.

The Printed Page

The printing press was a pivotal development of TL4. Sometime around the mid-15th century, somebody – possibly Johannes Gutenberg – developed the technique of making multiple copies using movable type. With a hand-screw press, one man could turn out 250 impressions an hour, which might be many pages of book or newspaper. That man, with less than half a ton of equipment, could transmit a point of view to *thousands* of people . . . if they could read. With the advent of printing, literacy went from being a luxury to a necessity. Printed works remained the standard means of information storage through TL7.

Printing Technology (TL4)

After its invention, the printing press evolved relatively little until the mid-19th century. The speed of these early presses limited the output of any one printer, encouraging diversity of production. Any city – and most towns – could support at least one printer. As literacy increased, so did the demand for newspapers and "job printing" (posters, handbills, waybills, pamphlets, flyers, etc.).

One possible job for an adventurer is that of "tramp printer." Anyone who can compose and set up type – using Professional Skill/TL (Typesetter) (IQ/A) – can find employment. It's an excuse to travel without being branded a vagrant or a ne'er-do-well. The trade lasts well into the opening years of the 20th century.

Hand-Screw Press (TL4). The real strength of this early press isn't its speed but its ruggedness – it requires nothing more than a weighty box of type, a large hand screw, and a wooden frame. 250 pages per hour. With typecase box: $2,500, 1,000 lbs. LC4.

Rotary Press (TL5). A rotary press' cylinders are much faster to crank than a hand screw. 1,000 pages per hour. With typecase box: $5,000, 1,000 lbs. LC4.

Steam-Powered Rotary Press (TL5). A gargantuan rotary press that uses rolls of paper. It cuts and folds newspapers automatically. Requires a crew of 10 men, plus a steam engine (p. 14) for external power. 12,000 pages per hour. $15,000, 10 tons, external power. LC4.

Offset Printing Press (TL6). A large, electrically powered press. 5,000 pages per hour. $30,000, 1 ton, external power. LC4.

Offset Printing Press (TL8). A high-tech printing press capable of producing full-color, photo-quality output on glossy paper. 10,000 pages per hour. $30,000, 800 lbs., external power. LC4.

Books (TL5)

"I cannot live," Thomas Jefferson once wrote, "without books." He acquired many thousands of books during his lifetime, twice selling off the most extensive private library in the United States at the time. On the first occasion, he sold over *6,000* volumes to replace the 3,000 volumes of the Library of Congress burned by the British in the War of 1812. His library was broad-based, and included works in Latin, French, and Italian, on topics as diverse as history, law, and the sciences.

Adventurers who need to do research or learn a new skill will likely turn to books. For the purpose of Speed-Reading (p. B222), assume that the average person reads 250 words per minute. A letter-sized page of printed, single-spaced text contains about 500 words. Handwritten text is approximately one-quarter as dense.

Books can sometimes replace expert knowledge. The GM may count reading a suitable reference work or following a repair manual's instructions *while actually performing a task* as the equivalent of using a skill at default – even if the reader would normally get *no* default! Roll against the attribute-based default appropriate to the skill's difficulty: attribute-4 if Easy, attribute-5 if Average, attribute-6 if Hard, or attribute-7 if Very Hard. Extra time gives the bonuses under *Time Spent* (p. B346), but these can at most remove the default penalty. This usually only works for IQ-based technical skills, but the GM may let suitable works – esoteric manuscripts, unspeakable tomes, magical spellbooks, etc. – enable default use of other skills. A generous GM might even apply *Quick Learning Under Pressure* (p. B292) afterward.

A typical book weighs 1-5 lbs. (***High-Tech*** weighs approximately 2 lbs.), a large dictionary like *Webster's Unabridged* weighs about 12 lbs., and a monstrous tome could weigh up to 25 lbs. At TL8, many "books" are computer data files; professional archivists estimate that an average book contains 10 MB of data. At any TL, prices range from free to hundreds of dollars for technical and reference texts.

A scholar under attack might use a book to ward off blows. This may save the defender, but it seldom does the *book* any good! Treat a large book as an improvised light or small shield (DB 1). It has DR 1-4 for cover purposes, depending on thickness.

Blank Book (TL5). A journal or diary. Higher-quality versions have a nicer cover. Holdout -1. $15, 0.5 lb. LC4.

Notebook (TL6). A pocket-sized book with a few dozen pages. At TL8, higher-quality versions have waterproof paper. Holdout -1. $1, 0.1 lb. LC4.

Libraries (TL5)

The personal library has long been the mark of a learned man. In 1790, George Washington's library exceeded 900 volumes – mainly on law and agriculture – and was approximately one-tenth the size of Harvard College's.

A library can be a useful tool for adventurers. The GM may allow a suitable library to serve as the curriculum when learning or improving a skill (see *Self-Teaching,* p. B293). Generally, the higher the skill levels involved, the more extensive the required library.

A library can also act as a reference for a skill – or for a skill *specialty,* if the skill allows *or* requires specialization (see p. B169). It permits Research rolls to look up answers to questions germane to that skill, possibly at a bonus for quality. The bonus for a high-quality library might sometimes extend to the skill itself, at the GM's option. Read the skill's description, in particular its specialties, to assess the breadth of a particular library; e.g., one could have a library for History (20th-Century Military) but *not* for History in general. If using a library for research outside its area, apply the modifiers under *Geographical and Temporal Scope* (p. B176) to Research rolls.

Many "libraries" are actually sizable collections on diverse topics stored in one place. Most public libraries would count as a basic library (see below) for *dozens* of subjects. A higher-quality library might be the sort of "special collection" found at a large university, and cover only a single, narrow field.

How big is a library? Librarians measure the size of a collection by the amount of shelving it occupies, in linear feet. A 7'-long bookshelf stacked eight shelves high is 56 linear feet. Average book count is 8-12 per linear foot. The Library of Congress is reckoned to be the largest library in the world, at nearly 3 million linear feet – over 530 miles of shelving. See the *Data Storage Table* (p. B472) for another way to compare library and database sizes.

Below, the listed price assumes a mundane skill. Libraries for magical research, Hidden Lore, etc., may cost 100 times as much, if they're available at all.

Small Collection. Perhaps a dozen works on a single topic. This is "improvised equipment"; if the GM allows a Research roll, it should be at -2 or worse. $350, 25 lbs. per skill.

Basic Library. A large shelf or small bookcase (approximately 10 linear feet) covering a particular field. Allows a basic Research roll on it topic. $3,500, 250 lbs. per skill.

Good Library. A couple of bookshelves (approximately 50 linear feet). Gives +1 to Research. $17,500, 1,200 lbs. per skill.

Fine Library. A dozen large bookshelves (several *hundred* linear feet). Gives +2 to Research. $70,000, 5,000 lbs. per skill.

Office Technology

Office technology has a somewhat humbler purpose than a tricked-out assault rifle or the newest encrypted radio, but even the most macho soldier knows that the technology of "bean-counters and clerks" brings efficiency and order to endeavors to which it's applied.

Business Cards (TL5)

Victorian gentlemen began the modern tradition of business cards by leaving "calling cards" that bore their name, address, and often a photo, drawing, and/or personal statement or motto. Better homes collected these in a book displayed near the front door, turned to the page containing the card of the most notable visitor. At TL8, business cards might be miniature CDs or DVDs, or digital files attached to e-mail or beamed from one PDA to another. Either type could contain encrypted national secrets – or a virus or other malicious software. Paper business cards are $1 per 100; CD or DVD versions cost about $0.50 each.

Calculators (TL5)

Totaling and tallying numbers is as important to a businessman or a scientist as bullets are to a soldier. Devices that facilitate this are part of the basic equipment for Accounting, Administration, Finance, and many scientific skills.

Slide Rule (TL5). Earlier versions existed, but the first commercially available "rules" appeared at the beginning of the Industrial Revolution and were used by carpenters, builders, and even Watt himself. Slide rules grew in functionality and standardization until they became *the* symbol of engineers and scientists – much like the stethoscope among physicians or the spyglass for military officers. Slide rules accompanied the Apollo astronauts. They only fell into disfavor in the mid-1970s, as the pocket calculator came on the scene. Even at TL7, a slide rule is part of the basic equipment for many scientific skills. $50, 0.5 lb. LC4.

Adding Machine (TL6). This mechanical gadget performs only basic arithmetic: addition, subtraction, multiplication, and division. Its columns of buttons represent cents, dimes, dollars, tens of dollars, etc.; another button or lever selects the mathematical function. When ready to calculate, the operator cranks the handle and the machine prints the result on a slip of paper. $500, 60 lbs., LC4.

Desktop Adding Machine (TL7). Transistors let the desktop calculator shrink to the size of a small typewriter. Integrated circuits make it even smaller – about as large as a paperback book. Basic four-function models appear first, followed by "electronic slide rules" capable of logarithmic functions. A typical 1970s desktop calculator: $300, 5 lbs., external power. LC4.

Scientific Calculator (TL8). A solar-powered pocket calculator. Contemporary units are about as small as they can be. The size limit is set by the operator, who must push the buttons and read the display! $30, 0.2 lb. LC4.

Letter Copiers (TL5)

In the age before automatic typewriters (p. 19) and photocopiers (p. 19), making a copy of a letter was a tedious process.

Copying Press (TL5). A letter-copying press was a common sight as late as the 1950s. The operator takes the letter to be copied and – without blotting it (the ink *must* still be wet) – puts it in the press. He then places a damp sheet of thin tissue on top of the letter and tightens the press. After a few seconds, he removes both the letter and the copy tissue. This makes *one* copy of the letter, and only a handful of copies are possible before the ink on the original dries completely. Each copy takes about 30 seconds. $100, 15 lbs. LC4.

Roller Letter Copier (TL6). This hand-cranked roller can make multiple copies of a freshly inked letter. As the device is cranked, the copies are rolled onto a continuous sheet of dampened paper, which is stored under the roller apparatus until it dries. The copies can then be unrolled and cut into individual sheets. $250, 50 lbs. LC4.

Writing Supplies (TL5)

These items can often be found in an office or briefcase.

Paper (TL5). Paper was made of linen or cloth scraps until TL6, when steam-powered presses switched to wood pulp. Paper dropped from a historical price of nearly $6 a pound at TL5 to $0.50 a pound at TL6. At TL8, a ream (500 sheets) of letter-sized paper is $2, 5 lbs. LC4.

Quill (TL5). A peacock- or goose-quill pen is the most common early writing instrument. A "pen knife" is used to trim the worn nib. Later models have metal nibs. $0.50, neg. LC4.

Carbon Paper (TL6). A typewriter can make up to 10 copies simultaneously using carbon paper. $0.10, neg. LC4.

Fountain Pen (TL6). This pen stores ink in a rubber bladder. It's filled using an eyedropper or by dipping the nib in ink and releasing pressure on the bladder. It's a messy and cantankerous device, but it can squirt ink (or another liquid . . .) up to a yard away – which can be a useful distraction. $3, neg. LC4.

Paperclip (TL6). The first commercial paperclips appeared around 1900. A pair of paperclips counts as improvised equipment (-5) for the Lockpicking skill. Box of 500: $1, 0.25 lb. LC4.

Ballpoint Pen (TL7). The first leak-free ink pen was sold in the 1940s. Ballpoints rely on capillary action rather than gravity feed. $0.50, neg. LC4.

"Space" Pen (TL7). A ballpoint pen that can write in vacuum, zero-gravity, underwater, and upside down. Uses a pressurized ink cartridge with a 100-year shelf life. $25, neg. LC4.

Duplicators (TL6)

Duplicators create copies from specially treated "masters," which last for about 500 duplicates. The *mimeograph* forces ink through a stencil. The *spirit duplicator* ("ditto machine") uses solvents to print from inked masters; its aromatic duplicates are familiar to school kids through TL7. A hand-cranked version of either averages 10-20 copies per minute, factoring in time spent fussing with it. $20, 25 lbs. LC4. Motorized models are 10 times as fast and as costly, and require external power.

Typewriters (TL6)

The first practical typewriter was available commercially in the United States in 1874. After 1880, typing is always a marketable skill. After 1900, it's practically a necessity for office employment – journalism, law, and many other professions require at least hunt-and-peck familiarity with the typewriter. For further details, see the Typing skill (p. B228).

With the typewriter come new ways to gain unauthorized access to records. Used carbons, discarded drafts, and even the piece of paper typists commonly roll around the platen can yield information. A successful Forensics roll can determine whether a specific machine was used to type a particular document.

Typewriter (TL6). The familiar QWERTY keyboard dates to the early 1870s. The "shift" key was perfected in 1878, allowing lowercase (earlier models typed only in capitals!). Visible-line typing came into use in the 1880s, previous to which the typist had to lift the carriage to see what he had typed. $20, 20 lbs. LC4.

Portable Typewriter (TL6). A lighter, smaller machine. Has a protective case with storage space for paper and supplies. $35, 6 lbs. LC4.

Electric Typewriter (TL6). A major feature of these typewriters is that several can be connected in series, allowing one operator to type several letters at once. Halve weight and cost at TL7. $250, 35 lbs., external power. LC4.

Automatic Typewriter (TL6). A mainstay of large corporations and military headquarters from the 1920s through the 1950s, the automatic typewriter tackles form letters and other repetitive work. It requires a special perforating typewriter that creates the roll – similar to that of a player piano – from which it reads and types the letter. Speed is 150 words a minute. $750, 50 lbs., external power. LC4.

Electronic Typewriter (TL8). A typewriter with memory, it stores dozens of pages of prerecorded text and recalls them at the touch of button. $200, 15 lbs., external power. LC4.

Photocopiers (TL7)

Chester Carlson worked for 15 years on *xerography* (Greek for "dry writing") before he finally produced a commercial product in 1950. The photocopier took off, selling 6,500 units over the next six years. Photocopying revolutionized the business world by simplifying and streamlining correspondence among decision makers.

Photocopier (TL7). Copies half a dozen pages per minute. $15,000, 650 lbs., external power. LC4.

Desktop Photocopier (TL8). A portable version that produces a dozen copies a minute. It can also print directly from a computer. $500, 30 lbs., external power. LC4.

Photocopier (TL8). Photo-quality copier that produces dozens of copies per minute. It can be networked to print from a computer. $6,500, 300 lbs., external power. LC4.

Computers

The first electronic computers were built in the 1940s. Distant descendents of electromechanical tabulators, these behemoths required tons of wiring and vacuum tubes, squandered power, and generated vast amounts of heat. They also solved complex mathematical problems faster and more accurately than humans could. The transistor (in the 1950s) and then the microprocessor (in the 1970s) greatly increased the speed of computers while simultaneously reducing their size and power consumption.

In the 1950s, only the government and big business could afford the gigantic computers of the day. By the 1980s, anybody in the developed world could buy a more powerful computer for less than a month's pay, and it would fit on a desktop! Programs such as word processors and spreadsheets increased the productivity of accountants, writers, and desk-jockeys of all descriptions.

Roll against Computer Operation (p. B184) to use a computer. Success lets you find information, access files, solve problems, and generally use a familiar system to the limits of its capabilities. Higher skill levels mostly reflect familiarity with more varieties of software and hardware. Computer design and repair call for Engineer (Electronics) and Electronics Repair (Computers), respectively.

Computer Networks

One computer is a powerful tool, but multiple computers are even more impressive. A *network* is two or more computers connected by telephone, radio, or cables. Linked computers are assumed to be able to communicate – but before TL8, or between unfamiliar computers, this is idealistic! If the plot turns on whether computers can communicate, the GM may require Electronics Repair (Communication) and Computer Operation rolls to deal with hardware and software incompatibilities, respectively.

The Internet (TL8)

The Internet is a global network of networks that connects people from far-flung corners of the Earth in ways previously unimagined. Its most visible part is the World Wide Web: billions of interlinked documents, both stored and generated on demand. These documents are often interactive, and tie together audio-visual content and such Internet applications as electronic mail, voice and video conferencing, and file- and resource-sharing.

Encrypted Networks (TL8)

A network can be made secure by using encryption software (p. 211) in concert with civilian protocols and software. Information is encrypted at one end, sent over the network, and then decrypted. Encrypted traffic might be routed over the normal Internet or over a completely isolated network.

The U.S. military's Secret Internet Protocol Router Network (SIPRNET) is an example of such a network. "Sipper" links the U.S. military command-and-control complex. Lieutenant General Tommy Franks used it to conduct daily videoconferencing with President George W. Bush throughout the 2003 Iraq War.

Penalties for unfamiliar equipment (see *Familiarity*, p. B169) are crucial here. Assess a -2 to skill for each of an unfamiliar operating system (e.g., Mac OS to Windows), computer type (e.g., tiny to mainframe), or program (e.g., targeting program to database). For obsolete or advanced equipment – say, a 1990s operator faced with UNIVAC – apply *Tech-Level Modifiers* (p. B168).

See also p. B472 for general computer rules and terminology.

Computer Types

These entries describe computers at TL8. For earlier TLs, select a model that's available at that TL *and* apply the effects of one of the options under *Alternate Technologies* (pp. 20-21). Storage capacity (e.g., typical integral hard-drive space – or at lower TLs, attached magnetic tape systems, punch-card libraries, etc.) is given in gigabytes (GB) at TL8. Reduce this to *kilobytes* (KB) at TL7, *bytes* at TL6.

Tiny Computer (TL8). The smallest multi-purpose computer available (e.g., a PDA). It's often built into another gadget, such as a cell phone. Complexity 1. Stores 1 GB. $50, 0.04 lb., 2S/5 hrs. LC4.

Small Computer (TL8). A typical palmtop or notebook computer. Complexity 2. Stores 10 GB. $100, 0.4 lb., M/5 hrs. LC4.

Medium Computer (TL8). A laptop or desktop PC, typical of those found in middle-class homes or small businesses. Complexity 3. Stores 100 GB. $1,000, 4 lbs., M/2.5 hours. LC4.

Microframe Computer (TL7). A cabinet-sized machine, rack of servers, etc. Complexity 4. Stores 1,000 GB (1 TB). $10,000, 40 lbs., external power. LC4.

Mainframe Computer (TL6). A computer capable of providing control and systems-monitoring functions for a major business, manufacturing complex, or laboratory. Complexity 5. Stores 10,000 GB (10 TB). $100,000, 400 lbs., external power. LC4.

Macroframe Computer (TL6). A *powerful* mainframe, typically the property of a government agency, major corporation, or university. Complexity 6. Stores 100,000 GB (100 TB). $1,000,000, 4,000 lbs., external power. LC4.

Megacomputer (TL6). A massive computer *complex* that fills a whole building or a series of subbasements. Complexity 7. Stores 1,000,000 GB (1,000 TB). $10,000,000, 20 tons, external power. LC4.

Customizing Hardware

Several options exist for customizing computers. These modify the Complexity, cost, etc., of the basic hardware. Multiply cost factors together, and do the same for weight factors; e.g., hardened (×2 cost) and fast (×20 cost) together give ×40 cost. Complexity modifiers are additive.

Compact (TL7). The computer uses lighter, more expensive components. ×2 cost, ×0.5 weight.

Hardened (TL7). The computer is designed to resist electromagnetic pulse (EMP), microwaves, etc. Add +3 to HT against these effects. ×2 cost, ×2 weight.

High-Capacity (TL7). The computer can run 50% more programs simultaneously (e.g., three programs of its own Complexity). ×1.5 cost.

Fast (TL8). The computer uses cutting-edge technology, giving it capabilities equivalent those of a system one size larger. May not be combined with slow. +1 to Complexity. ×20 cost.

Slow (TL8). The computer uses inexpensive processors, or is of an older design. May not be combined with fast. -1 to Complexity. ×1/20 cost.

Alternate Technologies

When designing a TL6-7 computer, you *must* select *one* of these options. If Complexity is below 0 after all modifiers, design a larger computer!

Mechanical or Electromechanical (TL6). This represents the primitive calculating machines of the 18th century. Charles Babbage's mechanical computer was designed to use gears, levers, and switches to process data. -5 to Complexity.

Vacuum Tube (early TL7). The first vacuum-tube computers were built in the 1930s and 1940s. Compared to integrated circuits, vacuum tubes are large, fragile, unreliable, and require prodigious amounts of power. It isn't uncommon for one or more tubes to fail whenever the power is switched on! Troubleshooting often involves crawling inside and looking for blown tubes – which can take hours or days. On the other hand, this kind of computer is considered *hardened* (see above) at no extra cost. -4 to Complexity.

Transistor (TL7). Transistor computers are smaller, faster, and more reliable than vacuum-tube machines. -3 to Complexity.

Terminals

A computer requires at least one terminal. At TL7 especially, it's possible that users might have terminals only, and rent time on networked systems.

Primitive Terminal (TL6). This encompasses all varieties of paper-tape readers, typewriter-like card punches, automatic card sorters, and blinking display panels. A task performed on primitive terminal may take an hour or more simply to set up. Deciphering the results takes several minutes of sifting through the output. $5,000, 500 lbs., external power. LC4.

Workstation Terminal (TL7). A standard desktop or office workstation, with a keyboard and a monitor (monochrome at TL7, color at TL8). It may include other accessories: mouse, speakers, microphone, digital camera, etc. Home systems at TL8 are generally medium computers with workstation terminals. Halve terminal weight. $500, 25 lbs., external power. LC4.

Portable Terminal (TL8). A reduced-scale but fully functional keyboard and color video display. It includes accessories such as a wireless communicator for networking, a digital mini-camera, and a speaker/microphone. It's adequate for most tasks, but the GM may rule that time-consuming or graphics-intensive tasks require a workstation terminal (above) to avoid a -1 penalty. It doesn't require a separate power source, instead tapping a small amount of power from the attached computer. Notebook and laptop computers at TL8 are typically small or medium computers with portable terminals. $50, 0.5 lb. LC4.

Datapad (TL8). A terminal for a PDA – including a tiny color video screen, a folding or laser-projection keyboard, and the accessories listed for a portable terminal (above). Complex tasks or those requiring use of the keyboard and screen for lengthy periods (GM's option) are at -2 to skill. Powered by the computer to which it's attached. $10, 0.05 lb. LC4.

Peripherals

For game purposes, a "peripheral" is an interface device used to interact with a computer.

Computer Printers (TL7)

Early TL7 printers are monsters cobbled together from other devices. *Desktop* printers appear at TL8.

Printer (TL7). A teletypewriter modified to print computer output. $2,500, 200 lbs., external power. LC4.

Desktop Printer (TL8). An inkjet printer or similar. Halve weight and double cost for a portable model. $100, 10 lbs., external power. LC4.

High-Quality Printer (TL8). Fine-quality laser or "dye-sub" equipment. Good enough for use with the Counterfeiting or Forgery skill. $5,000, 50 lbs., external power. LC4.

Document Scanners (TL8)

Scanners use a digital imager to turn a hard copy into an electronic file.

Document Scanner (TL8). A flatbed scanner. Good-quality (×5 cost) or fine-quality (×20 cost; essential for Counterfeiting or Forgery) equipment scans faster and at higher resolutions. $25, 2 lbs., external power. LC4.

Document Scanning Pen (TL8). An 8"×0.5" stick that scans a document as it rolls across a page (takes 4 seconds a page). It can be used on its own, storing 100 pages in memory and recharging when plugged into a computer. $150, 0.1 lb. LC4.

Head-Up Display (HUD) (TL8)

A HUD is a video display integrated into glasses or a helmet visor. It gives +1 to such skills as Driving or Piloting, where quick reaction to information is vital. The head-worn display weighs only a few ounces, but connects to a control unit and battery pack on the waist. $5,000, 1.5 lbs., 4×S/4 hrs. LC4.

Data Storage

Computers are assumed to be able to read and write removable storage media of their TL.

Primitive Storage (TL6)

Programs or data stored on punch cards, paper tape, and so on. Such storage is easily damaged or destroyed by nesting rats, coffee spills, etc. A 1,000 KB data archive is $20, 4 lbs. LC4.

Computer-Based Research

The primary benefit of the Internet (p. 20) is accessibility of information. However, too much information can be overwhelming. It's difficult to know which sources are believable – or deliberately false! Search engines help, but these have their own limitations; they often censor websites or direct users toward sites that pay for the extra traffic. The end result is that the Internet is simply *basic* equipment for Research/TL8.

A database (p. 22) might provide a bonus in a narrow area, depending on design and content – but most databases are basic equipment, too.

Better databases and search tools (see *Software Tools,* p. 22) count as good or fine equipment for Research. Standard bonuses and cost modifiers apply; see p. B345. Internet-based tools typically charge a monthly fee in addition to or instead of the software cost.

Magnetic Tape (TL7)

The whirring tapes and blinking lights of magnetic tape drives are commonly associated with TL7 computers, but magnetic tape is still used at TL8 because of its high density-to-cost ratio.

Magnetic Tape (TL7). A large reel of tape about the size of a hubcap. Holds 1-3 MB of data. Holdout -5. $100, 7 lbs. LC4.

Magnetic Tape (TL8). A tape cartridge the size of a deck of cards. Holds about 200 GB. Holdout -1. $50, 0.5 lb. LC4.

Magnetic Diskettes (TL7)

The two most popular diskettes at TL7 and early TL8 are the 5.25" disk and the 3.5" disk. They're vulnerable to strong magnetic fields, which can destroy the data. Hold from 100 KB to 1.44 MB. Holdout 0. $0.50, neg. LC4.

Optical Disks (TL8)

All TL8 computers are assumed to have a CD and/or DVD drive (GM's option). Disk capacity ranges from 650 MB to 8 GB. Holdout 0. $1, neg. LC4.

Digital Storage Device (TL8)

This is a small, nonvolatile memory chip. Many computers and electronic devices have a port for connecting to such media. Ranges from the size of a postage stamp (Holdout +4) to the size of a cigarette lighter (Holdout +1), and can be built into a variety of gadgets – even watches (pp. 31-32) and pocketknives (p. 31). A typical model costs $25 per GB of storage (or fraction thereof). Weight is negligible.

Software

A computer can be programmed to do almost anything, but *good* programming is expensive. Individual programs are rated for TL and LC – like other technology – and for their Complexity, which determines what systems they can run on (see p. B472). A program's TL and Complexity, in turn, set its cost; see the *Program Cost Table,* below.

The prices on the table assume professional and specialized software, such as engineering programs and targeting systems. In reality, software may cost a lot to develop but little to distribute. Mass-market software – computer games, popular operating systems, etc. – are cheaper, as the development costs are spread over a huge user base. Such programs may cost as little as 10% of these prices, or even be available as freeware. The actual cost of other software can vary greatly as well, depending on its nature and provenance (shareware, pirated, demo, open-source, etc.). At the GM's option, free versions (legal or otherwise) of almost any program may be available.

Descriptions of several programs appear in later chapters; e.g., *Encryption* (pp. 210-211). To write your own software, use Computer Programming (p. B184). *Tech-Level Modifiers* (p. B168) always apply to this skill! A master of punched-card programming from 1955 would boggle at today's techniques; his skill would be about as relevant as flint-knapping.

Program Cost Table

Complexity	*TL6-7*	*TL8*
Complexity 0	$300	$30
Complexity 1	$1,000	$100
Complexity 2	$3,000	$300
Complexity 3	$10,000	$1,000
Complexity 4	$30,000	$3,000
Complexity 5	$100,000	$10,000
Complexity 6	$300,000	$30,000
Complexity 7	$1,000,000	$100,000
Complexity 8	no	$300,000

Software Tools (TL6)

IQ-based technological skills (p. B168) at TL7+ normally require software to function at full effectiveness when performing tasks involving research, analysis, or invention. Software tools exist for many other skills at TL7+, too, including Accounting, Artillery, Engineer, Market Analysis, Research, and Writing. Such tools come in the usual quality grades (see p. B345):

Basic programs are *necessary* to perform the skill at its TL, and give no bonus. They're Complexity 2 for Easy skills, Complexity 3 for Average, Hard, or Very Hard skills.

Good-quality programs give +1 to skill. They're Complexity 4 for Easy skills, Complexity 5 for Average, Hard, or Very Hard skills.

Fine-quality programs give +2 to skill. They're Complexity 6 for Easy skills, Complexity 7 for Average, Hard, or Very Hard skills.

Software tools designed for highly specific applications of a skill – including but not limited to tasks that would be covered by techniques (p. B229) – may be one *or more* Complexity levels lower. This is very common at TL6-7!

Databases (TL6)

A *database* is a collection of information in computer-readable form, with built-in search and indexing programs. Estimate database size using the *Data Storage Table* (p. B472). For a database of a given size, the wider the subject covered, the sparser the details.

Database cost ranges from free for the information bundled with any system to *millions* of dollars for proprietary data, secrets, specialized information, or intelligence that cost lives or money to gather. Cost doesn't correlate so much with size as with information quality, copyright, supply, and demand. An encyclopedia or a similar item might be free for download or cost from $1 to $100.

Chapter Three
General Equipment

The blizzard was like nothing Nat had ever experienced. Even with the heating system, the thermal underwear, and all the windproof clothing, he figured they'd be dead by nightfall without shelter. He felt a slap on his shoulder and looked back.

Locke cupped his hands over Nat's ear and screamed through the din of the howling wind, "We've got to find a windbreak and pitch camp. We'll die out here!"

Nat pointed to a large outcropping up ahead – they would find shelter from the wind in its lee. Suddenly, he felt the snow give way to his left. He dove forward and buried his ice axe in the glacier as his comrades fell into the yawning crevasse . . .

Tools, radios, survival gear, and other mundane kit might not be as showy as weapons, spy-tech, and fast vehicles . . . but the experienced hero knows that on a *real* adventure, breakdowns, bad weather, and being unable to call for backup can be as deadly as any bullet or electric fence.

Tools

A few tools in the right hands can turn scrap into wonders. Henry Ford's first engine was built from a discarded steam pipe; his first workshop was a backyard shed. Charlie Taylor hand-built the Wright brothers' airplane engine in a bicycle shop in just six weeks, using little more than a drill press and a lathe.

Tools for All Trades

Tool Kits (see below) describes tools for the repair skills commonly used by adventurers, but kits and workshops exist for *many* other skills: Carpentry, Cooking, Leatherworking, Prospecting, Smith, and so on. These have the same skill (quality) modifiers, costs, weights, etc., as regular tool kits. For arts and light crafts that require fewer or lighter tools – e.g., Artist (Drawing), Artist (Painting), and Sewing – divide cost by 4 and weight by 10.

Tool Kits

Tool kits are essential to repair skills (see p. B190). A separate kit is required for Electrician, Machinist, and *each specialty* of Armoury, Electronics Repair, and Mechanic. You don't use an Armoury kit to repair a pistol – you use an Armoury (Small Arms) kit. The kit's quality determines the equipment modifiers (p. B345) that apply when using the relevant skill. If the item being worked on has a different TL from the tool kit, apply *Tech-Level Modifiers* (p. B168) as well.

The exact components of a tool kit are deliberately left vague. It suffices to say that tool kits contain a variety of appropriate tools and spare parts. At higher TLs, they might include power tools. They don't get cheaper, lighter, or more effective as TL increases. As gadgets get more complex, so do the tools needed to fix them!

Note that Mechanic (Vehicle Type) and Armoury (Vehicular Armor) tool kits and workshops can only perform major repairs on vehicles up to 10 tons. Multiply tool cost and weight by (vehicle weight in tons)/10 for larger facilities. For instance, a Mechanic (Submarine) workshop with a 2,000-ton capacity has 200× cost and weight.

See *Repairs* (p. B484) and *Breakdowns* (p. B485) for further details on repairs, maintenance, and spare-parts costs.

Mini-Tool Kit (TL5-8)

This is a belt-sized tool kit. At TL7-8, it may contain a few small batteries. It gives a -2 (quality) modifier for the specific skill and specialty for which it's designed. A kit for Electrician, Machinist, or any Armoury or Mechanic specialty is $200, 4 lbs. Kits for Electronics Repair specialties are $400, 2 lbs. LC4.

Portable Tool Kit (TL5-8)

This is the standard tool kit – the type found in a toolbox behind a truck seat or under the kitchen sink. It counts as basic equipment for the specific skill and specialty for which it's designed, and gives a -2 (quality) modifier for other specialties of the same skill. At the GM's option, such kits may have a handful of small batteries at TL7-8. A kit for Electrician, Machinist, or any Armoury or Mechanic specialty is $600, 20 lbs. Kits for Electronics Repair specialties are $1,200, 10 lbs. LC4.

Workshop (TL5-8)

This is an elaborate set of tools that fills a room. It has everything necessary for repairs or *fabrication* (welder, mill, lathe, etc.), including a wide range of materials and spare parts that can be tooled to specific requirements. It gives a +2 (quality) bonus to skill. Each skill requires its own shop, but the wrong type of shop is better than nothing – the quality modifier ranges from -2 for reasonably close crafts to -5 for distant ones. A workshop for Electrician, Machinist, or any Armoury or Mechanic specialty is $15,000, 2,000 lbs. Workshops for Electronics Repair specialties are $30,000, 500 lbs. All require external power. LC4.

Hand Tools

The most basic tools rely on elbow grease and mechanical advantage for their power. From the end of TL5, hand tools change relatively little in function, if not in form. A non-sparking NASA hammer is still essentially the same tool used by a TL2 blacksmith. Its ergonomics and construction have changed, but it still whacks things that need whacking.

> *I knew there was an old axe down cellar. That is all I knew.*
> *– Lizzie Borden,*
> ***Inquest of Lizzie Borden***

Axes (TL5)

When American frontiersmen moved into the Appalachians, they regarded the axe as *the* essential tool. A pioneer could hack a field out of a forest, build a house, cut fuel for his hearth, and even fashion a comfortable chair – all using nothing more than a simple axe.

An axe counts as improvised equipment for the Carpentry skill. Intricate work *is* possible, but it takes longer (see *Time Spent,* p. B346). If used in combat, treat most of these axes as a great axe (p. B274); see the descriptions for penalties to combat skill.

Broad Axe (TL5). This is an axe for hewing timbers. It has a wide and heavy head with a chisel-like cutting edge. The handle is bent or slightly offset from the head so the user can chop round logs into square timbers without busting his knuckles. -3 to Two-Handed Axe/Mace. $100, 6 lbs. LC4.

Felling Axe (TL5). An axe with a comparatively thin, light blade designed for felling trees. It rings like a bell when it strikes a tree; it's said that a skilled lumberjack knows the type of wood being struck by the "song" of a felling axe. $100, 5 lbs. LC4.

Spike or Fireman's Axe (TL5). A felling axe with "ripper" spike opposite the blade. Originally designed for boarding actions during the Age of Sail, it's still in favor among professional firemen today. Interestingly, collectors have

discovered authentic Napoleonic-era boarding axes in English firehouses, used unknowingly as common fire axes for nearly two centuries! With a Ready maneuver, the wielder can switch from the blade to the spike and use it as a warhammer. Gives +1 (quality) to Forced Entry skill. $100, 8 lbs. LC4.

Double-Bitted Axe (TL6). This axe has one edge ground thin for felling and delicate chopping work and the other left somewhat blunter for heavier cutting. $100, 5 lbs. LC4.

Splitting Maul (TL7). An axe suitable only for splitting logs, as the massive, wedge-shaped head is too clumsy for felling or hewing. Modern woodchoppers often have *only* a splitting maul – felling is done by chainsaw, not by axe. -3 to Two-Handed Axe/Mace. $100, 8 lbs. LC4.

Multi-Purpose Rescue Axe (TL8). A non-sparking, non-magnetic axe. The wicked-looking head has a pick opposite the blade (treat it as an axe or a pick in combat, depending on the side used). Like a barbarian's version of the Swiss Army Knife, it has cutouts in the blade and metal handle that allow it to function as a hydrant wrench, fire-hose spanner, or gas-shutoff tool. The haft end of the axe is shaped for use as a pry bar. Gives +1 (quality) to Forced Entry skill. $200, 4.5 lbs. LC4.

Miscellaneous Hand Tools (TL5)

Below is an assortment of tools that might be found in a tool kit or a workshop. In addition to being used with repair skills (see *Tool Kits,* p. 24), many work well with the Forced Entry skill (p. B196) and/or as improvised weapons (p. B404).

Bit and Brace (TL5). A hand-cranked drill and a set of bits. Does sw-2(2) pi++ per second when drilling through wood or similar materials. $30, 5 lbs. LC4.

Crosscut Saw (TL5). A two-man logging saw. Does sw-3(2) cut per second to wood. Add the two sawyers' ST scores to determine damage. $80, 8 lbs. LC4.

Grinder (TL5). A hand-powered grinder for sharpening blades. At TL6, it's powered by an electric motor, which uses external power. $35, 40 lbs. LC4.

Hacksaw (TL5). Does sw-3(2) cut per second to metal bars, chains, and cables. Early hacksaw blades ($5, 0.1 lb.) wear out after only a few minutes of use; TL7+ models with carbide or diamond teeth last *much* longer and get +1 to damage. $10, 2 lbs. LC4.

Hammer (TL5). Some have claws for removing nails, others have two heads. TL7+ models have all-steel heads and steel or fiberglass handles; halve weight. Treat as a small mace (p. B271) in combat. $15, 3 lbs. LC4.

Jack (TL5). A common piece of equipment for wagons, this simple brace and lever is capable of lifting 4 tons. A rope or metal bracket holds the lever in place. At TL6, a hand-pumped hydraulic jack weighs half as much but lifts twice as much. $75, 75 lbs. LC4.

Saw (TL5). A handsaw for carpentry. Does sw-2(2) cut per second to wood. $20, 3 lbs. LC4.

Shovel (TL5). When use to dig, see p. B350. When used as a weapon, treat as a cheap great axe (p. B274) at -2 to skill. $15, 6 lbs. LC4.

Sledgehammer (TL5). A two-handed hammer for driving posts, rock drills (p. 26), and so on. Treat as a maul (p. B274) at -2 to skill. $10, 15 lbs. LC4.

Whetstone (TL5). For sharpening tools and weapons. $5, 1 lb. LC4.

Wire Cutters (TL5). Do 2d(2) cut to rope, barbed wire, thin cable, etc. $30, 2 lbs. LC4.

Bolt Cutters, Heavy (TL6). Do 12d(2) cut to chains, bars, cables, etc., if the user can make a ST+4 roll. $50, 30 lbs. LC4.

Bolt Cutters, Light (TL6). As above, but do only 8d(2) cut. $30, 15 lbs. LC4.

Shovel, Folding (TL6). Entrenching tools are sometimes used by soldiers in close combat. Treat as an axe (p. B271) at -2 to skill. Holdout -4. $10, 3 lbs. LC4.

Utility Knife (TL6). A short handle with about 1" of blade at one end. Treat as a small knife (p. B272) that can only make cutting attacks. The blade is retractable and replaceable. $2, 0.25 lb. LC4.

Wire Saw (TL6). A serrated wire "commando" saw that does 1 point of cutting damage every *four* seconds. DR 5+ material will quickly ruin it. Works as a wire garrote (pp. B272, B405) at *no* penalty. $10, neg. LC4.

Superglue (TL7). One application holds up to 2 tons (ST 20). Also used in surgery for suturing! Per 10-use tube: $2, neg. LC4.

Shovel, Titanium (TL8). A corrosion-resistant, nonmagnetic, but otherwise normal shovel. $40, 4 lbs. LC4.

Multi-Function Knife (TL5)

Karl Elsener's multi-bladed folding knife was first issued to Swiss soldiers in 1891. Similar pocket knives were already common during the American Civil War – a favorite of telegraphers, among others. From the trenches of WWI to Space Shuttle flights and the International Space Station, the multi-function knife has been a coveted accessory of well-prepared people the world over.

Elsener's original knife had wooden scales concealing a clip-point blade, a screwdriver, an awl, and a can opener. The officer's model quickly followed. It added a second, smaller blade and the famous corkscrew.

Knives since then have added other features, including saw blade, scissors, magnifying glass, emergency whistle, toothpick, and tweezers. Treat the largest models as multi-tools (see below). At TL8, many multi-function knives come equipped with electronics such as a digital alarm clock, thermometer, altimeter, micro-flashlight (p. 52), or digital storage device (p. 22).

Depending on the job, the GM may treat a multi-function knife as improvised equipment (-5 quality) for minor repairs or as basic equipment for extremely simple tasks (e.g., using the screwdriver to open a gadget's case). A basic version is $25, neg. LC4.

Multi-Tool (TL5)

The *modern* Pocket Survival Tool was invented by Tim Leatherman in 1983, but similar "multiplex" tools have been around since the 1850s. Their versatility and compactness make them popular among soldiers and emergency personnel. Many variations exist, featuring such tools as blasting cap crimpers (p. 187), needle-nose pliers, locking pliers, digital tire-pressure gauges, saw blades, and different types of screw- and hex- drivers. Finishes range from stainless steel to stealthy matte black.

Like the multi-function knife (above), the utility of a multi-tool depends on the skill being used and the job at hand. It's probably at least improvised equipment (-5 quality) for most technological tasks. For routine tasks, the GM might allow it to stand-in for a mini-tool kit (p. 24). $50, 0.5 lb. LC4.

Rock Drill (TL5)

Often called a "jack," this is simply a long steel rod with a star-shaped cutting head. One man strikes it with a hammer while another man holds it and turns it a quarter-turn after each blow, causing the rod to bite deeper and deeper into the rock, expelling spoil as it goes. (This is the source of the term "jackhammer.") A set of progressively longer bits makes it possible to bore deeper holes. Such holes are often packed with explosives – for instance, to blast a railroad tunnel through solid rock.

A rock drill has an armor divisor of (2) and does huge piercing damage equal to a crushing blow struck against the drill; e.g., a ST 15 hammer man dishes out 2d+5 cr with a maul, so his jack does 2d+5(2) pi++. A set of rock drills ranging from 1' to 16' in length is $200, 200 lbs. LC4.

Duct Tape (TL6)

This WWII-era tape consists of three layers: a plastic covering, a cloth mesh, and a thick rubber adhesive. Silvery tape is most familiar (a testament to its use in air-conditioning vent work), but it comes in every color and even in camouflage patterns. Clever characters may use duct tape as improvised equipment (p. B345) for *many* tasks – repairs, bandaging, splint wrapping, etc. An entire roll can be braided into a 20-yard rope capable of holding 200 lbs. Duct tape is also a handy makeshift restraint; a prisoner must make a ST-3 or Escape roll to break free. A 60-yard roll is $1, 2 lbs. LC4.

> *Must have duct tape . . . Lots of duct tape.*
>
> *– MacGyver,* ***MacGyver,*** *"Legend of the Holy Rose"*

Glass Cutter (TL6)

In a cinematic campaign, the "circle cutter" is the definitive cat burglar's tool. The user attaches its suction cup to a window or a glass case, pivots the blade 360° to score a circle in the glass, and then uses the suction cup to lift out a perfect glass disk – allowing him to reach through and open locks, steal secret plans, etc. This procedure requires a DX or Forced Entry roll. Failure means a noisy break; critical failure also means 1d-2 cutting damage to the hand.

Real cutters don't work this way unless you're very lucky. For one thing, scored glass must be tapped on the *far* side to break it out! Rolls for this stunt are at -6 in a realistic game. $140, 1 lb. LC4.

Power Tools

Portable power tools are a fairly recent development. At TL4 and below, tools powered by beast, wind, and water exist, but they're not portable! At TL5, steam engines enable semi-portable power tools, and carts, wagons, and small ships serve as platforms for both the tools and the necessary power plants. At TL6, widespread adoption of electricity and internal combustion engines makes powered tools *truly* portable. At TL7, battery power greatly increases portability. As TL8 progresses, fuel cells and micro-engines promise to further revolutionize the field.

Sewing Machines (TL5)

The first functional automatic sewing machine was invented in 1830 in Paris. It was so efficient that Parisian

tailors ransacked the first sewing-machine factory in an attempt to destroy it.

Sewing Machine (TL5). A treadle-powered machine produces over 200 stitches a minute versus a professional tailor's 30. Gives +1 (quality) to Sewing skill. $50, 100 lbs. LC4.

Electric Sewing Machine (TL6). Capable of 1,500 stitches per minute. Gives +2 (quality) to Sewing skill. $250, 100 lbs, external power. LC4.

Steam Powered Tools (TL5)

At TL5, many crafts and industries use semi-portable steam engines (p. 14) to power tools. The boiler and engine are mounted on a wagon and pulled from one work site to the next by draft animals.

Drill (TL5). This tripod-mounted drill does 6d(2) pi++ per second to concrete or rock. $2,000, 500 lbs., external power. LC4.

Pump (TL5). Pumps 200 gallons per minute. $5,000, 450 lbs., external power. LC4.

Saw Mill (TL5). Can produce 2,000 board feet of lumber per day (200 10' boards, 100 20' boards, 80 25' boards, etc.). As examples, the *HMS Bounty* was built from 400,000 board feet of lumber, while a modern 2,000-square-foot home requires about 13,000 board feet. $7,500, 2 tons, external power. LC4.

Miscellaneous Power Tools (TL6)

These tools might be found in a workshop or used on their own, most often at a construction site.

Air Compressor (TL6). A portable compressor for filling tires, hard-hat diving, or operating air-impact or hydraulic tools. Consumes 1 gallon of gasoline per hour. Halve weight at TL8. $100, 125 lbs. LC4.

Air Compressor Hose (TL6). For air-powered tools. Per 5' length: $5, 1 lb. LC4.

Circular Saw (TL6). Does sw+3(2) cut per second. At TL8, halve weight and cost; cordless versions use a battery (M/30 minutes). $150, 20 lbs., external power. LC4.

Cutting Torch (TL6). Does 1d+3(2) burn per second, with 30 seconds of cutting time per bottle (extra bottles are $50, 5 lbs.). $75, 7 lbs. LC4.

Jackhammer (TL6). Referred to as a "breaker hammer" by professionals, this is a giant, two-handled beast for demolishing concrete, stone, and asphalt. It does 7d(2) pi++ damage per second. At TL6, it requires an air compressor and hose; at TL8, weight is halved and it runs off normal building power. $1,500, 160 lbs., external power. LC4.

Power Drill (TL6). Does 1d+2(2) pi++ per second to wood, plastic, or metal. Diamond or carbide replacements bits are $40 each. The similar *rotary hammer* does 2d+2(2) pi++ to concrete or rock, and has 10× cost and 5× weight. At TL8, battery-powered versions are available (M/30 min.). $50, 2 lbs., external power. LC4.

Pocket Torch (TL7). Does 1d-2 burn per second, with 20 minutes of burn time ($1 for refills). Burning at up to 2,500°F, it can melt lead, aluminum, gold, tin, silver, glass, etc. $25, neg. LC4.

Plasma Torch (TL8). Does 3d+6(2) burn per second. Requires a small tank of compressed air every 10 minutes (see *Air Tanks,* p. 74) – or an air compressor. $2,000, 35 lbs., external power. LC4.

Chainsaws (TL7)

A German engineer invented the first *practical* portable, gasoline-powered chainsaw in the 1920s. Such early saws were two-man contraptions, with one man holding the engine and the other moving the cutting bar. One was smuggled out of Germany in 1941, and the U.S. Army asked American manufacturers to copy and improve upon it – which they did. By 1950, the chainsaw was a one-man affair.

As a rescue tool, a chainsaw uses the Forced Entry skill. In combat, it uses the Two-Handed Axe/Mace skill. While fearsome when wielded against defenseless vacationers, it has several problems as a real weapon against determined foes. A chainsaw has an (0.5) armor divisor when striking or parrying anything made of concrete, metal, or a material of comparable hardness (*not* wood, plastic, flesh, bone, etc.). If it fails to penetrate DR, it can malfunction. Roll 1d: on 1-2, nothing happens; on 3-5, the chainsaw stalls and must be restarted; and on a 6, the chain snaps. At TL7, a snapped chain whips around and strikes the wielder for 1d cutting damage; at TL8, it simply breaks the saw until it can be repaired.

TWO-HANDED AXE/MACE (DX-5, Axe/Mace-3, Polearm-4, or Two-Handed Flail-4)

TL	Weapon	Damage	Reach	Parry	Cost	Weight	ST
7	Chainsaw	sw+1d cut	1	0U	$150	25	11‡
8	Chainsaw	sw+1d cut	1	0U	$150	13	10‡

For double cost, a carbide-toothed chain can be had. This eliminates the (0.5) armor divisor and the accompanying limitations on cutting hard materials.

Nail Guns (TL7)

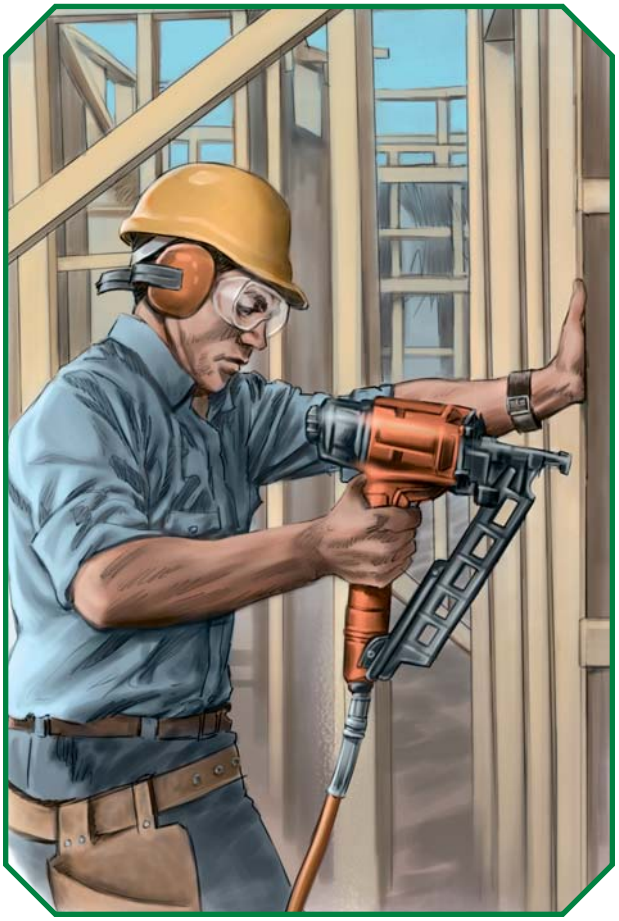
The first *pneumatic* nail guns come on the scene at mid-TL7. These require an air compressor and hose (p. 27), but can drive nails at twice the rate of a skilled carpenter and are much faster when driving nails in awkward positions. *Powder-actuated* models also appear at TL7, and use an explosive akin to a pistol primer to drive the nail. At TL8, *combustion* nail guns ignite small quantities of fuel from a tiny internal tank to propel the nail; nails are loaded in long strips held together by glue or paper.

A nail gun usually has a safety that prevents it from being used as a projectile weapon, but often this can be simply bypassed (held to the rear with the off hand – or a paperclip). A somewhat cinematic weapon, it uses DX-4 or Guns (Pistol)-4. It has Dmg 2d-1 pi-, Acc 0, Range 5/25, RoF 1, Shots 50(3), ST 11†, Bulk -4, Rcl 2.

Pneumatic Nail Gun (TL7). Holds 50 nails. $200, 7 lbs., external power. LC4.

Powder-Actuated Nail Gun (TL7). Uses 10-shot blank cartridge strips ($0.7, 0.01 lb.). Holds 50 nails. $220, 5 lbs. LC4.

Combustion Nail Gun (TL8). Drives 1,000 nails per fuel canister ($7, 0.15 lb.). The rechargeable battery can ignite four fuel canisters before being drained. Holds 50 nails. $350, 8 lbs. LC4.



Industrial Equipment

These items may equip a corporate or university facility, a remote government base, or a mad scientist's lab.

Blueprints (TL5)

Blueprints are a set of drawings and/or instructions for manufacturing an item. A full set of blueprints provides all the information necessary to make the item, assuming one has the necessary skills, tools, and materials. Legal blueprints for many commercial goods are subject to licensing fees, royalties, and other charges – typically 10%-50% of the item's base cost. LC is equal to that of the item.

Blueprints (TL5). Early blueprints had white lines on blue paper. Since TL7, blueprints have used blue lines on white paper. The original process was invented in the 1840s, for making copies of military maps in the field. It didn't catch on with architects and designers until the 1900s.

Computer-Aided Design (CAD) Project (TL8). A set of computer files for use in computer-aided manufacturing (see below). They're Complexity 2 for items costing up to $100, Complexity 3 for devices up to $1,000, etc.

Computer-Aided Manufacturing (TL7)

In the 1950s, the aerospace industry began wedding computers and industrial tools in an effort to increase efficiency. These early "numerically controlled tools" exceeded human capacity in speed and accuracy, but were so expensive that few companies could afford them. As computers became cheaper in the 1970s, computer-aided manufacturing (CAM) flourished.

The advantage of CAM is "agile" or rapid manufacturing: the ability to design and produce parts in hours rather than months, and to retool for a new job in minutes. In 2003, during the Iraq War, the U.S. Army's Mobile Parts Hospital in Kuwait received a call to design and produce a machine-gun mount for a truck door. The part was ready in only five hours and flown to Baghdad the same day!

There are two distinct CAM technologies. A *computer numerically controlled* (CNC) workshop uses computer-controlled and automated mills, lathes, etc., to remove material from a block of metal, plastic, or wood to create a part. The tools are guided by a computer, and drill, grind, and cut until the part is completed.

Rapid prototyping (RP) is fundamentally different. Instead of removing material, RP uses powders or liquids to *create* a part, layer by layer. The "print head" moves back and forth like that of an ink-jet printer, depositing materials in minute layers until the component is completed. The disadvantage of RP is speed: on average, RP is much slower than CNC when producing a part of the same size.

Rapid prototyping machines produce parts from only one class of material: metal, ceramic, or plastic. This must be decided when the workshop is purchased, and cannot be changed afterward. For instance, a workshop that builds plastic *and* metal parts would need two separate RP devices. Assume that RP machines can work multiple materials

within their category; the cutting edge of RP technology, *laser engineered net shaping* (LENS), can fabricate production-ready parts from several different metals and alloys – titanium, aluminum, stainless steel, etc.

Regardless of the underlying technology, CAM equipment uses the Machinist skill. The GM may consider a CAM workshop an appropriate facility for building certain inventions (see *New Inventions,* p. B473). All CAM devices require CAD project files (p. 29).

Workshop CNC (TL7). A professional-grade CAM workshop like those used by NASCAR racing teams, custom firearms producers, and after-market specialty shops. It can fabricate 10 lbs. of parts per hour. Gives +2 (quality) to Machinist skill. $250,000, 2 tons, external power. LC4.

Desktop CNC (TL8). The smallest available CNC device fits on a tabletop. It can fabricate 0.5 lb. of parts per hour. It counts as basic equipment for Machinist. $25,000, 200 lbs., external power. LC4.

Workshop RP (TL8). Similar to the workshop CNC, but for RP work. It can fabricate 1 lb. of parts per hour. Choose whether it manufactures metal, ceramic, or plastic components. Gives +2 (quality) to Machinist skill. $500,000, 2 tons, external power. LC4.

Desktop RP (TL8). This unit can fabricate 0.1 lb. of parts per hour. Choose whether it manufactures ceramic or plastic (but *not* metal) components. It counts as basic equipment for Machinist. $2,000, 35 lbs., external power. LC4.

Mini-Manufacturing Workshop (TL8). An elaborate portable factory. One example is the U.S. Army's Mobile Parts Hospital. It fits in two 20' shipping containers: a workshop RP for metal in one, a workshop CNC for metal in the other. These provide a combined +4 (quality) to Machinist skill. $1,000,000, 13.5 tons, external power. LC4.

3D Model Scanner (TL8)

This refrigerator-sized unit fully scans a sample part placed inside it in 15-30 minutes, depending on the model's size and complexity. With small alterations, such a scan becomes a usable CAD project file (p. 28). $5,000, 200 lbs., external power. LC4.

Rescue Tools

At TL5-6, the hardware used by rescue workers consists largely of regular hand tools (pp. 24-26) and power tools (p. 27). Elaborate, purpose-built rescue tools begin to appear at TL7, in the racing and aviation industries. They soon become a lucrative business.

Many of these tools use the Forced Entry skill (p. B196) or a Professional Skill (p. B215) such as Firefighter. At the GM's discretion, troops from military units that receive training in the use of rescue equipment may roll against Soldier skill (p. B221).

For the breathing equipment (masks, tanks, etc.) and protective clothing used by firefighters and other emergency workers, see Chapter 4.

Hand Ram (TL6)

This is a one-man battering ram, used by SWAT teams to knock down doors. Against a braced, unmoving object such as a door, roll against Forced Entry to hit. A successful attack does sw+3d+1 cr. The ram has Reach 1 and ST 20†, requiring either a strong wielder or at least two Ready maneuvers between strikes. Used as a weapon, it functions as a clumsy maul (p. B274): -3 to Two-Handed Axe/Mace.

In practice, SWAT team "breachers" take an Evaluate maneuver and aim for the area just above or below the door handle. A miss generally means hitting another part of the door, possibly punching a hole in it without knocking it down. A critical miss may jam the door in the frame, which necessitates wasting valuable seconds to get it open. Either means a *very* loud knock that may alert hostile inhabitants to the arrival of "guests"!

A non-sparking, nonmagnetic model costs double but comes in handy if the door being busted down leads to a volatile drug lab. $150, 35 lbs. LC4.

Miscellaneous Rescue Tools (TL6)

Many of the following items are likely to be found at the scene of an accident, or in an emergency vehicle, a fire station, or a shipboard damage-control locker.

Fire Extinguisher, Large (TL6). Good for 20 one-second bursts. Has a 3-yard range; see *Cone Attacks* (p. B413) and *Attacking an Area* (p. B414) for rules. It puts out a fire immediately on a roll on TL+2 or less. $75, 20 lbs. LC4.

Fire Extinguisher, Small (TL6). As above, but only capable of eight one-second bursts at a 2-yard range. $50, 8 lbs. LC4.

Spanner Wrench (TL6). A firefighter's multi-tool, used to connect fire hoses, operate fire hydrants and gas mains, and cut seat belts. In combat, treat as a small mace (p. B271) at -2 to skill. $15, 3 lbs. LC4.

Come-A-Long (TL7). A lever-operated pulling device. It moves objects at only a few feet per minute but has Lifting ST 25. $20, 15 lbs. LC4.

Go-Bar (TL7). This heavy-duty, non-sparking, and nonmagnetic "gorilla bar" is typically used with the Forced Entry skill to bust locks, hinges, and other door hardware. Treat it as a maul (p. B274) in combat, at -2 to skill. $175, 17 lbs. LC4.

Stokes Litter (TL7). A wire basket that holds a single casualty securely during a risky evacuation (up a cliff, across a river, via rescue hoist, etc.). The occupant has DR 5 in the event the litter is dropped or suffers a collision. $500, 20 lbs. LC4.

Cable Ladder (TL8). A flexible 10-yard ladder with aluminum steps suspended between two cables. $100, 5 lbs. LC4.

Carbon Monoxide Monitor (TL8). Alerts firefighters or workers in confined spaces to dangerous carbon monoxide levels. $350, 0.25 lb., XS/40 hrs. LC4.

Crowbar, Titanium (TL8). Non-sparking, nonmagnetic tool for Forced Entry. Treat as a small mace (p. B271) in combat, at -1 to skill. $50, 2 lbs. LC4.

Doorbuster (TL8). The so-called "knock-knock gun" resembles a pistol with chisel replacing the barrel. The user holds the head against a lock, hinge, bolt, etc., and pulls the trigger, which causes the chisel to slam forward with great force: 4d(2) pi++. It uses 10-shot strips, as described for the nail gun (p. 28). $1,500, 6 lbs. LC3.

Folding Ladder (TL8). This goes from a briefcase-sized package to a 16' ladder in two seconds; capacity is 300 lbs. $300, 20 lbs. LC4.

Hydraulic Door Opener (TL8). A hand-pumped hydraulic spreader jack for *silently* forcing open locked or barred doors. After three Ready maneuvers spent pumping, it inflicts 10d cr to doors and doorjambs. $1,500, 9 lbs. LC4.

Lock Buster (TL8). A hooked beak that's placed on a padlock and then struck with a sledgehammer. It *doubles* the damage done to the padlock. $50, 3 lbs. LC4.

Thermal Imager (TL8). Rescue teams use thermal imagers to search for victims through smoke, and to detect hot spots inside walls, electrical equipment, etc. See *Thermographs* (p. 48).

Rescue Hoist (TL7)

This is a hand-cranked hoist with a working load of 500 lbs. (see *Rope,* p. 56) and a lifting speed of 8 yards per minute. It's either attached to a tripod ($1,500, 75 lbs., 3-ton rating) for use over manholes or vertical mine shafts, or clamped to a tree, vehicle bumper, window sill, or other sturdy attachment point. $3,500, 20 lbs. LC4.

Rescue Spreader/Cutter (TL7)

This powerful tool is used by crash squads, firefighters, rescue teams, and salvagers. The operator holds a cutter/spreader unit, which resembles nothing so much as a gigantic pair of pliers. Five yards of hydraulic line link this to a small gas engine and a hydraulic compressor, which power a piston that can open and close the jaws with tremendous force.

Opening or closing the jaws is a long action requiring four consecutive Ready maneuvers. Each "bite" with the cutter involves four seconds for the jaws to open and four more seconds for them to close. Reversing the switch causes the jaws to spread wide open. This can damage structures (e.g., car doors) or lift many tons – although the total lifting *distance* is only about a foot.

Rescue Spreader/Cutter (TL7). The handheld unit does 6d×4(2) cr per activation, has Reach 1 and ST 16†, and weighs 38 lbs. It has Arm ST 36, BL 259 as a spreader. The power pack weighs 50 lbs. and uses 1 gallon of gasoline per hour. $15,000, 90 lbs. LC4.

Rescue Spreader/Cutter (TL8). The handheld unit does 6d×5(2) cr per activation, has Reach 1 and ST 14†, and weighs 23 lbs. It has Arm ST 45, BL 405 as a spreader. The power pack weighs 30 lbs. and uses 0.5 gallon of gasoline per hour. $15,000, 55 lbs. LC4.

Fire Shelter (TL8)

A fire shelter resembles a sleeping bag made of reflective, nonflammable material. It protects those inside it from being burned alive in a wildland fire, giving them DR 10 vs. burning damage. Users might still die from breathing superheated air, however; see *Heat* (p. B434). $400, 5 lbs. LC4.

Firefighter Alert System (TL8)

This is a personal alarm worn by firefighters. The user must shake it at regular intervals (20 seconds is common) in order to reset it. Should it remain motionless – presumably because its wearer is trapped or incapacitated – it will sound a piercing audible alarm (+4 to Hearing). This gets progressively louder, alerting those nearby that a firefighter is down, pinned by debris, or otherwise in need of help. For double cost, it also has temperature alarm that goes off when the wearer has been in especially hot areas (200-350°F) for too long or when the temperature increases rapidly – which may indicate that a flashover is imminent. $100, 0.25 lb., XS/40 hrs. LC4.

Lift-Bag Kit (TL8)

A "lift bag" is a reinforced bag designed to lift or shift a heavy load as it's inflated. It's connected to an air compressor (p. 27) or the power pack of a rescue spreader/cutter (see above). A standard kit includes an assortment of bags capable of lifting from a couple of tons to more than 70 tons. $5,000, 75 lbs. LC4.

Personal Devices and Consumer Goods

These goods might seem even more pedestrian than ordinary tools (pp. 24-26) and expedition gear (pp. 51-61), never mind weapons and armor. However, a cane, a waffle iron, or a belt can come in handy when no *real* weapons are handy – and food and household goods are often crucial to long-term survival.

Personal Accessories

The right accessories are vital when dressing to impress. Some of these items are worn or carried; others are used to straighten up before stepping out. All are marks of the neat, the stylish, and the well-heeled, and are likely to take advantage of *Styling* (p. 10).

Belt (TL5). A belt can be *incredibly* useful. It can retain holsters and sheaths (pp. 153-154, 198), conceal money or a survival kit (pp. 58-59) in its lining (+4 to Holdout), or act as an improvised climbing harness (p. 55). The buckle can hide a dagger, a push knife (p. 197), or a small gun. $10-$50, neg. LC4.

Don't Forget Your Towel!

A towel is valuable to any adventurer – interstellar or not. Besides being useful when bathing, it can serve as a blanket, a fire tender, clothing, or a head covering. Attached to a stick, it's a legionnaire's pack – or a sail. It's a privacy screen, a signaling device, or a cushion for an uncomfortable seat. Lashed to a foot and stuffed with newspapers, it's a passable arctic boot. A soldier can use it to keep body armor from chafing or to cushion his helmet, or cut it into strips for bandages or a weapon sling.

At TL5-6, a 2'×4' towel is $5, 1 lb. At TL7-8, a 2'×4' microfiber towel – quick-drying and highly absorbent – is $30, 0.25 lb.

Cane (TL5). A walking stick – possibly with ornate carvings, exotic woods, a sculpted or silver handle, etc., all of which would count as styling. It's useful for pointing, poking, and, if necessary, fighting (for *rifle* canes, see p. 98; for *sword* canes, see p. 197). $5, 2.5 lbs. LC4.

Cigar or Cigarette Case (TL5). Holds half a dozen cigars or 20 cigarettes, a box of matches, a cigar cutter, etc. Ulysses S. Grant was known to smoke 20 or more cigars a day. $30, 0.1 lb. LC4.

Collapsible Cup (TL5). Usually pewter or steel. $3, neg. LC4.

Grooming Kit (TL5). A leather Gladstone, vanity, or toilet bag holding comb, hairbrush, razor, toothbrush, soap, aftershave, shoe-polish kit, etc. $25, 0.5 lb. LC4.

Handbag or Waist Pack (TL5). A woman's purse, a doctor's medical bag, or a day-hiker's fanny pack. Holds up to 10 lbs. $10, 1 lb. LC4.

Hip Flask (TL5). Holds 1 pint. Holdout -1. $10, 1 lb. (full). LC4.

Mirror (TL5). Handy when applying makeup – and for peering around corners and signaling. At TL5-6, it *will* break if dropped! At TL7-8, it's made of nearly indestructible plastic. $5, neg. LC4.

Pocket Watch (TL5). The pocket watch is a TL4 invention, but it isn't until TL5 that it's accurate to within a minute a day. The second hand becomes common at TL6, by which time watches sometimes include other features, such as calendars and moon-phase indicators. Other innovations at TL6 are the so-called "perpetual," which is self-winding, and the ultra-reliable "railroad" watch, which is certified as being accurate enough for train engineers. A good-quality pocket watch is $100, neg. LC4.

Pocketknife (TL5). A small knife with one or more short, folding blades. The largest pocketknife blade *might* count as a small knife (p. B272) at -1 to damage; the shortest aren't useful weapons. See *Multi-Function Knife* (p. 26) for a more utilitarian alternative. $5, neg. LC4.

Religious Symbol (TL5). A small crucifix, rosary, ankh, etc. $1, neg. LC4.

Sewing Kit (TL5). Travelers and soldiers have long carried a "housewife" to mend torn fabric. This includes a needle, several colors of thread, a thimble, etc. It counts as basic equipment for sewing. $1, neg. LC4.

Tobacco Box (TL5). Holds 1-2 oz. of tobacco. The removable lid on 18th-century Hudson's Bay Company models has a built-in burning glass for lighting a smoke in sunny weather! $20, neg. LC4.

Umbrella (TL5). A folding umbrella keeps the rain off and is useful for prodding suspicious items. $5, 1 lb. LC4.

Attaché Case (TL6). A briefcase with a simple lock. $20, 2 lbs. LC4.

Wristwatch (TL6). Initially, the "wristlet" – a small watch worn at the wrist – is a lady's accessory. At mid-TL6, though, soldiers fit pocket watches to leather wrist straps in order to keep their hands free in combat. These "trench watches" feature leather or pierced-metal "shrapnel guards" to protect the crystal face under harsh conditions. A TL6 wristwatch might be self-winding or waterproof, have luminous hands or a date function, or show the time in several time zones, but a given watch seldom has multiple features – pick two, if it matters. The best mechanical watches lose 10 seconds a day through TL6; "synchronizing the watches" is an important part of military operations. At TL7, battery-powered quartz watches appear; digital displays follow. This is the first time a watch can be said to be accurate to within a second, day after day. A good basic watch is $25; a luxury watch, such as a Rolex, can go as high as $40,000! Weight is negligible. LC4.

Propane (TL6)

Propane gas cylinders commonly fuel barbecue grills (p. 32) and camp stoves (p. 57). They're also potent field-expedient explosives. To set one off, it's necessary to rupture the cylinder near a flame (like the ever-popular hand flare, p. 58). If *any* non-crushing damage penetrates the cylinder's DR 6, the cylinder will rupture and ignite into a huge fireball. The explosion does burning damage, calculated according to *Demolition* (p. B415) using the cylinder's full weight and assuming a REF of 0.5. Fragmentation from the cylinder alone is 1d cutting.

Small Cylinder (TL6). A disposable tank for camp stoves, lanterns, etc. (4d×2 burn ex). $5, 1 lb. LC4.

Large Cylinder (TL6). A bulk tank, often found under a barbecue grill or on the exterior of a camper trailer (6d×5 burn ex). Swapping an empty tank for a full one at a retailer costs about $8; a brand new tank is $45, 14 lbs. LC4.

Gadget Wristwatch (TL8). At TL8, miniaturization lets wristwatches contain a bewildering array of gadgets. Some common features are altimeter, barometer, calculator (p. 18), cell phone (p. 39), compass (p. 52), digital camera (p. 43), digital storage device (p. 22), dosimeter (p. 49), GPS (p. 53), pepper spray (p. 180), and thermometer. Treat such watches as improvised equipment (-5 quality) for relevant technological skills. To reduce the penalty, the operator must spend extra time fiddling with the controls (see *Time Spent,* p. B346). Prices start at $100 and rise quickly; minimum cost is that of the built-in gadget. Weight is negligible. LC4.

Appliances

Whether one is taking a rest between moments of danger or skulking through a home during a black op, the most mundane items can sometimes prove important.

Refrigeration (TL5)

The "Ice Revolution" begins at TL5. Ice cut from ponds, lakes, and rivers is buried under sawdust and kept in icehouses throughout the warm season. In the 19th century, ice-cooled freight cars transported meat by rail to New England from packing plants in Chicago – a common market for rangy Texas longhorns fresh from the cattle drive.

This is a *profitable* business. The Ice King, Frederic Tudor, shipped thousands of tons of ice from Boston to Charleston and New Orleans – and later to Havana, Calcutta, and Singapore. He secured low freight rates by offering the ice as ballast to ship owners. "Ice speculator" would be an excellent cover for the globetrotting adventurer at TL5.

At TL5, home refrigeration means an icebox of heavy oak, with sawdust and/or a zinc-lined container as insulation. Initially an appliance of the rich, the icebox is common among the middle class by TL6. Door-to-door ice deliveries by wagon are a colorful part of the American landscape until the late 1940s.

The refrigerator gradually replaces the icebox through the second half of TL6. The first "electric icebox" is a big hit, but pricey: in 1925, it cost more than a Ford Model T! Cutting-edge TL8 fridges are "smart," capable of tracking their contents and ordering replacements over the Internet.

Ice (TL0). At TL5, transportation and storage make harvested ice expensive: $5 a pound. At TL6, mechanically produced ice is *much* cheaper: $0.05 a pound.

Icebox (TL5). Holds 50 lbs. of ice. Has 3 cubic feet of storage space plus an internal 2-gallon water cooler. A 25-lb. block of ice will last 2-4 days, depending on the temperature. DR 2. $300, 140 lbs. LC4.

Refrigerator (TL6). Holds 9 cubic feet. Includes the newfangled "freezer" for making ice cubes. DR 2. $3,000, 400 lbs., external power. LC4.

Refrigerator (TL8). Holds 20 cubic feet. Has a freezer, ice maker, and water tap. DR 2. $800, 200 lbs., external power. LC4.

Stoves (TL5)

At TL5, the cook stove burns wood, is made of heavy cast iron (at least 1/4"), and uses a surprisingly sophisticated arrangement of baffles and louvers to manage air flow, thereby regulating heat and reducing fuel consumption. A night's fuel is an armload of wood (p. 15); cooking a meal requires only a log or two. In warmer regions, the stove may not reside in the home – the kitchen is often an outbuilding, for both comfort and safety.

The surface of a cast-iron stove gets *hot* – red hot. Somebody falling on a hot stove (or held there by a couple of thugs) can get a serious burn. Depending on the temperature, this inflicts from 1d-1 to 2d burn damage per second. Of course, the same is true of the burners and heating elements of modern stoves.

At TL6, kerosene, natural gas, and electric stoves take over. At TL7, microwave ovens come on the scene. The first are water-cooled, refrigerator-sized behemoths, used only in institutional settings – but by TL8, almost every home kitchen has a microwave oven.

Cast-Iron Cook Stove (TL5). A box or "pot-bellied" stove. The stovepipe is fitted with a small baking oven or a water-heating jacket. DR 12. $200, 250 lbs. LC4.

Electric Range (TL6). Three or four burners and an oven. DR 2. $500, 150 lbs., external power. LC4.

Gas Range (TL6). A large oven and six burners, connected to neighborhood gas lines. DR 6. $750, 400 lbs. LC4.

Barbecue Grill (TL7). Henry Ford and Thomas Edison developed charcoal briquettes, which were sold at Ford dealerships until the 1950s. Gas grills (×2 cost) are more common at TL8, and use propane tanks (p. 31). $75, 30 lbs. LC4.

Microwave (TL7). A heavy-duty institutional model does 1 HP per second to things placed inside it, such as severed zombie hands and annoying little purring furballs. DR 1. $500, 100 lbs., external power. LC4.

Miscellaneous Appliances (TL6)

Halve the weight of these appliances at TL7-8.

Blender (TL6). A blender can make margaritas and quickly mince a hand (1d-3 cut per second). $50, 4 lbs., external power. LC4.

Coffee Maker (TL6). A pot of scalding coffee does 1d-3 burn. $10, 5 lbs., external power. LC4.

Hotplate (TL6). Does 1d-3 burn to a hand pressed to it. Useful for lab experiments! $20, 8 lbs., external power. LC4.

Toaster (TL6). Does 1d-3 burn to a hand trapped in it. Later models pop up and automatically switch off (rigging one as a time-delay trigger requires a Traps roll). $30, 10 lbs., external power. LC4.

Vacuum Cleaner (TL6). Helpful for collecting specimens, cleaning up alien spores, etc. $200, 20 lbs., external power. LC4.

Waffle Iron (TL6). Damage is as for a hotplate. Handy for making soles for athletic shoes, too. $30, 5 lbs., external power. LC4.

Washing Machine (TL6). Scrubs 10 outfits an hour. Gadgeteers often scavenge the useful motor. $1,000, 250 lbs., external power. LC4.

Foodstuffs

"An army marches on its stomach," Napoléon Bonaparte once said – an astute observation from a man who died of stomach cancer. Fuel and ammo might sustain a band of adventurers through chases and firefights, but even action heroes need to eat.

Traditional Methods (TL1)

A multitude of traditional food-preservation methods are still in use at TL5-8. As with all food-storage techniques, the goal is to prevent the growth of bacteria that cause spoilage.

Smoking meat or storing it in brine kills the bacteria. Drying meat removes the water that bacteria need to survive; it also reduces the meat to 25% of its previous weight (e.g., 20 lbs. of fresh meat makes 5 lbs. of jerky). Meat thus preserved may last for weeks or months.

Pack a Lunch

Two high-tech items are vital for adventurers on lengthy stakeouts:

Lunch Box (TL6). A metal box with space for a large lunch and a thermos bottle. DR 1. $10, 1 lb. LC4.

Thermos Bottle (TL6). A glass-lined flask fitted with a cork stopper. A plastic drinking cup attaches to the top. A dropped thermos usually means a shattered liner – but at TL7, the all-steel thermos solves this problem. Keeps one pint hot (24 hrs.) or cold (72 hrs.). $10, 2 lbs. LC4.

Milk can be turned into longer-lasting products. At TL5, a dairy cow provides one or two gallons of milk a day; a goat, half a gallon. At TL8, a cow bred for milk production and pumped full of hormones produces *seven* gallons a day; a goat may produce a gallon or more. A gallon of milk weighs 8 lbs.; 10 lbs. of milk yield 1 lb. of cheese or 0.5 lb. of butter. Cheese dipped in wax (the *rind*) can keep for years, while butter can be stored unrefrigerated for several days before going rancid.

At TL5, grains are harvested, threshed, winnowed, and stored dry and whole; flour is produced in batches. Fruits and vegetables dried in the sun will keep all winter if stored in the root cellar, buried in the garden, or kept in sawdust-filled barrels. Melons, peaches, and other "wet" fruits are kept in a springhouse or a well.

At TL6+, refrigeration (p. 32) and vacuum packaging help preserve *all* food much longer.

Canned Food (TL5)

In 1795, Napoléon Bonaparte's Society for the Encouragement of Industry offered a prize of 12,000 francs for a better way of preserving food. French candy-maker Nicholas Appert stepped forward to claim the prize in 1809. His process of boiling food inside a sealed glass jar proved to keep food safe to eat for months. Within a few years, canned food was being sold around the world.

In 1858, John L. Mason combined a threaded glass jar with a tin lid and rubber seal. Prior to this, attempts at home canning involved hot wax or melted lead, and were slow, tedious, and dangerous. Mason's resealable jars allowed rural families to "put up for the winter" with confidence.

Home canning requires some special equipment, but it's as effective as factory canning. A home canner working at a leisurely pace can preserve 100 lbs. of food a day. Canners concerned about the fact that glass jars don't tolerate rough handling can use food-grade tin cans and a can sealer at home. Few actually bother, though – the necessary machinery is more expensive than that required for jars.

Canned food loses taste and nutritional content, texture, and coloration over time. Most sources suggest two years as a reasonable shelf life. Because tin cans are sealed and sterile, though, the food inside is microbiologically safe for *much* longer. In 1865, the steamboat *Bertrand* sank on the Missouri River. When it was discovered more than 100 years later, chemists from the National Food Processors Association analyzed the canned food onboard. They found no microbial growth, and rated the food safe for consumption!

Early canned food wasn't always so safe. In 1845, Captain Sir John Franklin set out from England to find the Northwest Passage through the Arctic waters north of Canada. He took 129 hand-picked men and had two ships – the *Terror* and *Erebus* – specially equipped with iron prows, heated cabins, and steam-powered screw propellers. The expedition vanished somewhere in the Arctic wastes, with only a handful of skeletons and a lifeboat to indicate its fate. Recent forensic examination of the remains revealed that the Franklin party suffered from acute lead poisoning (see *Lead Poisoning,* see below). It seems that their canned food was poorly prepared, contaminated by the tin-lead solder used to seal the cans. Experts surmise that the poisoning caused the explorers to make a series of bad decision, including leaving the ships, and they eventually succumbed to a slow, agonizing death in the Arctic.

Can Opener (TL5). The first can opener is a large, hand-cranked device often found bolted to a table. Canned food manufacturers recommend using a hammer and chisel! At TL6, a can opener costs $0.50 and fits on a key ring, or is built into pocketknife (p. 31) or a multi-tool (p. 26). $5, 0.5 lb. LC4.

Lead Poisoning

Taken in sufficiently large doses (0.25 oz. or more for a typical human), lead is a digestive agent with a three-month delay and a HT-4 roll to resist. It inflicts 1d toxic damage, repeating at six-week intervals for three cycles. Once the victim loses 1/2 of his basic HP, he begins to suffer more severe symptoms. At the GM's option, he may gain Bad Temper (15) or Laziness, or suffer spells of the agony, daze, or retching afflictions (p. B428). Loss of appetite is also common. Multiple failed resistance rolls lead to intensifying symptoms, eventually resulting in seizures and coma (p. B429).

Food Canner (TL5). A pressure cooker and/or mechanical canner, plus all of the tools and supplies needed for canning in glass jars; double price for equipment to seal tin cans. $150, 25 lbs. LC4.

Dehydrated Food (TL5)

From 1756, a dehydrated "portable soup" was issued to sailors in the British Navy: a broth of vegetables and meat reduced to a rubbery consistency and then pressed into a cake. It was despised by British seamen, but American explorers Lewis and Clark carried 200 lbs. of it on their journey to map the newly acquired Louisiana Territory. During the American Civil War, "desiccated" vegetables and potatoes, oven-dried and compressed into blocks, were issued to Union soldiers – and received with complaint and loathing. Recipes for dehydrated food improved gradually, until at TL8 there was enough interest in the technique to market electric dehydrators (possible but not desirable at TL6) to homemakers.

Despite the savings in weight and the excellent storage properties of dehydrated foods, they're less convenient to use than other preserved foods. They require large amounts of water to reconstitute, and some foods must be soaked for *hours* before they're completely rehydrated.

Dehydrator (TL8). Dehydrates 25 lbs. of food in 24 hours. $250, 22 lbs., external power. LC4.

Food Additives (TL5)

Nutrients and minerals are sometimes added to prepackaged and canned foods. This can improve a society's overall health. Examples include iodine added to salt, niacin added to bread, and vitamin D added to milk.

Preservatives are also common. At TL6-8, they increase shelf life by 50% or more – perhaps *much* more. There are many types; for instance, antimicrobials prevent the growth of bacteria while antioxidants slow the oxidation of fats. Sulfur dioxide does both, and predates TL5 as a preservative for wine. Other examples include borax at TL6 and antibiotics at TL7.

And in an action-movie game, repressive regimes, archvillains, etc., might add psychoactive or addictive drugs to food . . .

Frozen Food (TL6)

Refrigerated food generally keeps for days or weeks, while frozen food – stored in a home deep freeze or the walk-in freezer at a butcher shop – lasts for months to years. For further details, see *Refrigeration* (p. 32).

Freeze-Dried Food (TL7)

Freeze-drying, or *lyophilization,* is essentially a fancy dehydration technique. It involves freezing the prepared food in a vacuum and then heating it slightly to remove the water by sublimation. The end result is food that has lost about 98% of its water content.

This is a costly process, but it preserves the taste and texture of the food much better than simple dehydration. Freeze-dried foods are often processed as ready-to-eat meals, while dehydrated foods are usually packaged as bulk foods. Freeze-dried food can last for 30 years or more.

Retort-Packaged Food (TL8)

Retort packaging is the greatest advance in food preservation since canning. The food is cooked, sterilized, and then packaged in a plastic pouch or tray. It may be loaded with preservatives, or exposed to radiation or UV light to kill microbes; many retort foods are completely natural, and thus have a better taste and quality than conventional canned goods. Retort packaging allows sandwiches, bread, and even pastries to sit on the shelf for *years* and still be fresh and nutritious. While the results are more fragile than cans, shelf life is 5-10 years if kept cool. Modern U.S. military rations (MRE, or "Meal, Ready to Eat") are retort-packaged.

Miscellaneous Foodstuffs

Below are some foods of special interest to TL5-8 adventurers. An asterisk (*) indicates a TL0-1 item manufactured at and priced for TL5-8.

Canned Food (TL5). One meal of canned provisions: $1, 1 lb. A case of 24 cans (8 man-days) in a wooden crate: $24, 30 lbs.

Dehydrated Food (TL5). One meal of dehydrated soup or vegetables. Requires a pint of hot water. $5, 0.75 lb.

Desiccated Vegetables (TL5). A block of chopped, dehydrated, and compressed mixed vegetables. Makes 3 meals. $3, 2 lbs.

*Fresh Food** (TL5). A meal of ready-to-prepare food: vegetables, seafood, meat, fruits, etc. Shelf life is limited without refrigeration. $3, 2 lbs.

*Hardtack** (TL5). A dried cracker, 3"×3" by U.S. Army regulations, made from flour, salt, and water. Keeps indefinitely. Per meal (10 crackers): $0.50, 1 lb. Per crate (16 man-days): $25, 50 lbs.

Luxuries

Man has always enjoyed a few little extras, without which morale suffers. Modest amounts of such things are included in cost of living when at home; the prices below are for *basic* luxuries bought on their own. People with the Connoisseur skill (p. B185) can bribe and impress with finer fare – treat this as *Styling* (p. 10). For alcohol and other drugs, LC varies with local laws.

Alcohol: A bottle of wine (5 drinks) or liquor (16 drinks of rotgut, schnapps, vodka, etc.), or a couple of bottles of beer, ale, etc. (2 drinks). See *Drinking and Intoxication* (p. B439). $5, 2.5 lbs.

Candy: A bag of "hard candy" or half a dozen candy bars is $3, 0.5 lb.

Recreational Drugs: A "hit" of the preferred *cheap* local recreational drug. A single use is typically $1-$25.

Tea or Coffee: A daily serving for a month is $5, 1 lb.

Tobacco: A month's supply of tobacco, in various forms (cigarettes, cigars, chewing tobacco, or pipe tobacco) is about $20, 1 lb.

*Jerky or Pemmican** (TL5). A meal of well-seasoned and salted meat, reduced to only 4 oz. by drying. Pemmican mixes animal fat and dried fruit with the meat, adding important nutrients. It was a favorite of trappers and Indians throughout the 18th and 19th centuries, and the staple of Arctic explorers up to the 1930s. $2, 0.25 lb.

Portable Soup (TL5). A dehydrated and concentrated soup made by boiling beef broth until only a gelatin-like substance remains. One meal: $1.50, 1 lb.

*Trail Food** (TL5). A minimalist meal for travelers: jerky, pemmican, hardtack, parched corn, dried fruit, etc. Today, backpackers carry GORP: "good old raisins and peanuts." $2, 0.5 lb.

Freeze-Dried Food (TL7). A generous meal of freeze-dried potatoes, lasagna, bacon and eggs, etc. Requires a pint of hot water. $4, 0.25 lb.

Snack (TL7). A high-carbohydrate snack such as an "energy bar" counts as a "decent meal" when resting, restoring +1 FP; see *Recovering from Fatigue* (p. B427). The GM may let those who don't rest regain 1 FP but dock them *2* FP two hours later. $2, 0.25 lb.

Sports Drink (TL7). A 32-ounce drink formulated to increase hydration and energy levels. It functions like a snack (above) *and* counts as a quart of water for hydration purposes (see *Dehydration,* p. B426). $2, 2 lbs.

Survivalist Food Cache (TL7). A full year's supply of freeze-dried food for one person. $2,500, 600 lbs.

Compressed Rations (TL8). A single, highly compressed, retort-packaged meal. No water needed. $6, 0.75 lb.

Military Rations (TL8). A retort-packaged MRE or similar, with entree, side-dish, condiment pack, dessert, and meal heater (p. 57). Per meal: $5, 1.5 lbs. Twelve meals in a cardboard box: $60, 22 lbs.

Survival Tablets (TL8). These chewable tablets provide the minimum nutrients to survive for a short period. One quart-sized bottle (which can be used as canteen when empty) provides sufficient calories and nutrients for 6 meals. Shelf life is 10 years. $25, 1.5 lbs.

Communications

Getting a message to a distant party hasn't always been as easy as sending e-mail or dialing a number.

Mail and Freight

For a period of 18 months, the Pony Express braved 2,000 miles of whooping Indians, scorching deserts, and blinding blizzards to deliver the mail from St. Joseph, Missouri to Sacramento, California in just 10 days on average. Delivery of Abraham Lincoln's inaugural address was their fastest run: a hair less than eight days. Rail (and telegraph) eventually put long-range dispatch riders like the Pony Express out of business. Today's cheap, reliable overnight express mail makes *all* of these accomplishments seem lumbering and unreliable.

Railroads (TL5)

The steam engine revolutionized the mail business. Its strength, dependability, and high speed rendered all other methods obsolete. In 1804, Richard Trevithick's *Penydarren* managed 5 mph; 25 years later, Robert Stephenson's *Rocket* won the Rainhill Trials at the then-blistering speed of 25 mph.

Trains and train routes come in three varieties: *local, long-haul,* and *express*. Local trains move slowly and stop frequently. Long-haul trains stop less frequently and travel at higher speeds. Express trains have only a few stops and move as fast as is practicable. At TL8, high-speed passenger trains can be thought of as "super-express" trains – France's TGV, Germany's ICE, and Japan's *Shinkansen* reach speeds of 170 mph or more!

Early Rail (TL5). Normal operational speed is 30-40 mph; averages 200-800 miles per day. A standard railcar carries 20 tons or 2,800 cubic feet. Price per passenger or per ton of cargo is about $1 per mile.

Mature Rail (TL6-7). Normal operational speed is 50-75 mph; averages 300-1,200 miles per day. A standard railcar carries 100 tons or 5,200 cubic feet. Price per passenger or per ton of cargo is $0.10 per mile.

High-Speed Passenger Rail (TL8). Normal operational speed is approximately 150 mph; routes are seldom longer than a few hundred miles. Price per passenger is $0.33 per mile.

Steamers and Liners (TL5)

Sailing vessels continue to compete with steam until TL6 – but in 1807, Robert Fulton's *Clermont,* a 100-tonner whose paddlewheels barely made 5 mph, ushered in a new age in water transport. Steam had a profound impact on river traffic, where constant thrust against the steady current was desirable. The ability to choose a course regardless of wind direction proved invaluable in navigating narrow channels.

Shallow-draft steamers opened the interiors of Africa and Asia to European colonial powers. The steamboats of the Mississippi proved the utility of steam-powered cargo vessels – despite an appalling safety record – and were followed by larger ships like the *RMS Britannia,* which crossed the Atlantic in 11 days in 1840. By the turn of the century, steamers routinely completed the trip in a week. Speed continued to improve through TL6. In 1938, the *RMS Queen Mary* crossed the Atlantic in just under four days, securing the Blue Riband – the trophy for the fastest North Atlantic crossing.

At TL7-8, passenger liners become bigger and safer, while new hull designs enhance stability during foul weather.

Early Steamships (TL5). Steamers range in size from 500 to 5,000 tons, sustain speeds of 10-20 knots, and average 300-400 miles a day. Price per passenger or per ton of cargo is $3 per mile.

Passenger Liners (TL6-8). Liners and freighters may exceed 100,000 tons, sustain speeds of up to 30 knots, and average 400-600 miles a day. Price per passenger or per ton of cargo is $0.10 per mile.

Airmail (TL6)

Airmail becomes possible at mid-TL6; the first mail planes carry a few dozen pounds. By TL7, this improves to dozens of *tons*. At TL8, overnight delivery on the same continent is possible (assuming the package doesn't get lost!). Worldwide delivery can take a couple of days with express mail, a couple of weeks at normal shipping rates.

TELEGRAPH

Early electric telegraphs, powered by primitive batteries, used a switch to open and close a circuit on a wire, thereby signaling from one station to the next. The first telegraph networks were established in the 1840s. By 1860, the major cities of the eastern U.S. were connected by telegraph, as were parts of Europe. In 1861, California was linked to the Atlantic coast. During the American Civil War (1861-1865), Grant's Army of the Potomac was in telegraph contact with Washington, D.C.; President Lincoln spent many evenings in the War Department's telegraph office, anxiously reading reports from the front as they were decoded.

Telegraph went on to bridge continents in 1866. The Great Transatlantic Cable required several costly and time-consuming attempts before it succeeded. In July 1866, over 1,700 miles of cable finally connected Heart's Content, Newfoundland with Valencia, Ireland. By the end of the 19th century, only a few remote locations *weren't* part of the telegraph network, which connected the world with blistering speed.

Telegraphs (TL5)

The range of a telegraph depends directly on the power use to push the signal through the line. At TL5, one large battery (p. 13) is needed per 10-20 miles of wire. Long distances require relays. Automatic relays between human-operated stations make relaying messages less labor-intensive.

Telegraph messages must be sent in code. This generally means Morse code. Roll against Electronics Operation (Communications) (p. B189) to send or receive a message. Success means the message is sent or read correctly. Failure means it isn't understood. On a critical failure, it *seems* fine but is badly misunderstood. Garbled messages are a wonderful opportunity for some devious GM creativity!

Telegraphers can put Electronics Operation (Comm) to several *interesting* uses. For one thing, they can encipher messages. Such messages are harder to send and receive accurately, since spelling can't be corrected from context (e.g., "hte" isn't obviously "the"). All skill rolls involving enciphered messages are at -4.

Every telegrapher has a distinct *fist:* his way of sending a message. A successful skill roll lets one operator recognize another by his fist. To fake a fist, the imposter must *win* a Quick Contest of Electronics Operation (Comm) with the recipient. The faker rolls at -6.

Finally, a telegrapher can tap a line to intercept a message or send a false one. At TL5, a tap is impossible to detect and requires only an uncontested Electronics Operation (Comm) roll. At TL6, the snoop must *win* a Quick Contest of skill with the intended recipient to avoid alerting him that somebody is listening in.

Telegraph Rates (Var.). At TL5, rates are $10 per word (Transatlantic rates were $50 per character!). At TL6-7, telegrams are $0.50 per word – or $2.50 per word internationally. A TL8, a paper telegram, delivered worldwide the next day, costs $15 for 200 words. LC4.

Telegraph Key (TL5). A simple telegraph that can push a signal through 10-20 miles of wire. $150, 3 lbs., external power. LC4.

Register Telegraph (TL5). A telegraph that prints received messages on paper tape, allowing the operator to decode them at a later time. $5,000, 30 lbs., external power. LC4.

Automatic Telegraph (TL5). This telegraph uses punched paper tape to *send* a message at 300-400 words per minute. It's useful for sending large amounts of information repeatedly, such as news reports or military orders to multiple units. With perforator, transmitter, and receiver: $7,500, 100 lbs., external power. LC4.

Stock Ticker (TL6). A telegraph receiver that prints out business stock prices. Historically, New York City had so many stock tickers running that "ticker tape" was used for confetti during parades and celebrations. Renting a stock ticker line costs $200/month. $3,000, 25 lbs., external power. LC4.

Telegraph Wire (TL5)

Telegraph wire is strong enough to span continents and oceans. Permanent landlines are suspended on head-height or lower poles alongside roads or railroads. They require frequent maintenance. A good lineman inspects and repairs the line in his zone, regardless of the danger or the weather. A "line shack" holds tools, wire, and possibly a relay and a power source – and in winter, a warm pot-belly stove, and perhaps a cot for the lineman. Temporary lines are another matter; U.S. Army doctrine during the Civil War was to place military lines on fences or convenient bushes!

Heavy submarine cables are laid by ship. Paying out cable and splicing the ends together at sea is a difficult job.

Telegraph Wire, Land (TL5). Per mile: $1,500, 350 lbs. LC4.

Telegraph Wire, Ocean (TL5). Wrapped in heavy, tar-covered rope. Per mile: $10,000, 2 tons. LC4.

TELEPHONE

In 1876, Alexander Graham Bell developed the first practical telephone. Less than two years later, the first

commercial switchboard system was implemented in New Haven, Connecticut. By 1890, every major U.S. city had a phone system (some had two or more competing systems). Most major European cities had such a network, too – run as a government monopoly. Quality was variable; e.g., Paris had a good network, but the rest of France had poor service. An indication of how fast the telephone system spread is the number of phones in the United States: less than 3,000 in 1877, but almost *1.5 million* by 1900!

Long-distance lines soon tied together local networks – but only between major cities at first. In the U.S., long-distance connections spread from the Eastern Seaboard. Boston and New York were linked in 1884. The lines reached Chicago in 1892, but didn't go much further until after the turn of the century.

At early TL6, calls are difficult to set up and involve one or more operators. Transmission and reception are variable; misunderstandings are common. Routing a call from one phone to another requires the caller to "switch hook," which alerts the switchboard operator that a call needs to be placed. The operator cuts in, asks "Name please?", and then manually patches the phone into the correct line. The GM may demand IQ rolls at penalties of up to -4 to interpret hasty or easily confused messages.

The fact that all calls involve an operator can be important to adventurers. In small towns, the local operator is likely to know an inordinate amount about everybody else's business. This may be an excellent source of information, a serious leak of secrets, or a channel for planting disinformation. In larger cities, the operator's intimate knowledge may be less encompassing – but there's always the *chance* that a call was noted or listened to. A friend at the telephone company is the easiest way to bug a call. Furthermore, the log of calls is an actual log-book, and crafty or well-connected snoops might be able to sneak a peek.

By mid-TL6, automated switchboards use relays and vacuum tubes instead of hand-patched connections. Phone numbers enter use, along with rotary-dial phones that allow callers to dial these numbers directly. Calls no longer involve speaking with an operator and being routed by name, increasing convenience and privacy.

Another important TL6 advance is the teletypewriter – or "teletype" – which marries the principles of the telephone and the telegraph. A teletype can send a text message or a photo to one other phone number or to *every* line in a directory. News services capitalize on this feature to post bulletins to entire networks, making it almost impossible for news-makers to outrun the news!

Telephones (TL6)

These are conventional, landline telephones. For radiotelephones, cell phones, and satellite phones, see *Radio* (p. 37).

Communications Wire (TL6). A mile of phone line on a hand-held spool, used to link two military telephones, phone and switchboard, etc. $15, 35 lbs. LC4.

Military Telephone (TL6). Sound-powered – meaning that a hand crank rings a connected phone and a loud voice generates the power to carry the message. $50, 5 lbs. LC4.

Telephone (TL6). $25, 3 lbs., external power. LC4.

Telephone Switchboard (TL6). A portable 10-line switchboard; female operators worked these behind the trench lines during WWI. $1,000, 50 lbs., external power. LC4.

Teletype (TL6). Prints text from information transmitted via phone line. From the 1920s, a model capable of printing photos is available for ×2 cost – or ×4 cost if it can handle *color* photos (TL7). Renting a teletype line costs $500/month. $7,500, 200 lbs., external power. LC4.

Phone Service

Until mid-TL6, long-distance phone calls are simply *impossible* owing to the patchwork nature of telephone networks. The first transcontinental telephone line dates to 1915. Even then, such calls are prohibitively expensive: a call from New York to Havana in 1921 cost $130 for three minutes!

At TL7, fully automated switchers and highly sophisticated networks, which often bounce radio waves off the upper atmosphere or use orbiting communications satellites, allow relatively inexpensive worldwide phone calls in seconds. Digital phone services can carry data, too – but initially, this is both slow (a few bytes per second) and costly ($100/month). Phone service costs about $30/month. At TL8, this includes call waiting, voice mail, etc.

Radio

Radio is probably the most impressive advance in communications at TL6. The first transmissions were made after 1900. By 1950, there were still places without phone lines . . . but the whole world was tuned into radio!

At mid-TL6, radio installations are large and clumsy, and found only on ships or at permanent land sites. It's easier to send Morse code than voice; in fact, long-range messages generally go by code until the end of TL6. Size and weight drop constantly, driven primarily by military demand. By early TL7, transmitters and receivers come in all sizes – from "Handy-Talkies" with a range of a few hundred yards to multi-ton installations with intercontinental range.

Radios (TL6)

Radios can send and receive code or voice transmissions. When connected to a terminal or a computer (see *Computers,* pp. 19-22), they can also exchange text, video, or data. Use Electronics Operation (Comm) (p. B189) to operate radio hardware – but don't bother rolling for operation under normal circumstances. Use Electronics Repair (Comm) (p. B190) for service and repair.

Radio range is given in miles. However, many factors can affect *effective* range; see *Radio in Use* (p. 38).

Large Radio (TL6)

These "base station" radios are normally vehicle-mounted or carried in heavy transport cases. They often work on "short wave" frequencies (see p. B91). It takes about 15 minutes and an Electronics Operation (Comm) roll to set up a large radio and its antenna.

Large Radio (TL6). Radios like this are used in scout planes, mounted on sleds during Arctic expeditions, and carried by mule teams across the Andes. 50-mile range. $3,500, 100 lbs., 3×M/3 hrs. LC3.

Large Radio (TL7). A typical aircraft radio. 100-mile range. $5,000, 100 lbs., VL/10 hrs. LC3.

Large Radio (TL8). A radio found in a large police department or a military HQ. 200-mile range. $15,000, 100 lbs., external power. LC3.

Medium Radio (TL6)

These are military-style backpack radios. Similar-sized systems are often installed in such military vehicles as tanks and small aircraft.

Medium Radio (TL6). One of the first backpack radios, like the U.S. Army's "Walkie-Talkie," this is beastly to carry, fragile, and short-ranged . . . but it allows mobile communication, which is a breakthrough. 5-mile range. $2,500, 30 lbs. 4×M/14 hrs. LC4.

Medium Radio (TL7). A medium-range radio, common during the Vietnam War. 10-mile range. $3,500, 25 lbs., 10×S/30 hrs. LC4.

Medium Radio (TL8). A high-tech patrol radio. Military versions often have the encryption, GPS, and satellite uplink options. 35-mile range. $2,000, 8 lbs., 2×M/30 hrs. LC4.

Small Radio (TL6)

These are handheld radios, typical of those used by police and security forces.

Small Radio (TL6). A massive radio, the size of shoebox, like the "Handie-Talkie" used in WWII and Korea. Similar civilian kit-built radios were available in the 1930s. 1-mile range. $250, 5 lbs., 3×S/10 hrs. LC4.

Small Radio (TL7). Police and rescue squads used these radios from the early 1960s to the 1980s. 2-mile range. $500, 2 lbs., 3×S/8 hrs. LC4.

Small Radio (TL8). A standard handheld radio. Military versions often have encryption and GPS capability. 5-mile range. $250, 0.5 lb., 3×XS/10 hrs. LC4.

Tiny Radio (TL7)

These palm-sized radios fit in a pocket.

Tiny Radio (TL7). A standard pocket radio with a pull-out antenna. 0.5-mile range. $100, 1 lb., XS/5 hrs. LC4.

Tiny Radio (TL8). A civilian pocket radio. High-end models may have GPS capability. 2-mile range. $50, 0.25 lb., XS/10 hrs. LC4.

Radio Options (TL6)

As well as modifiers for quality (p. B345) and the options under *Integrating and Modifying Equipment* (pp. 9-10), radios may have some special modifications. Multiply cost factors together, and do the same for weight factors.

Code-Only (TL6). Many early radios are "CW-only," meaning that they can only transmit in Morse code (or similar). This lowers bandwidth but can greatly increase range; see *Radios in Use* (see above). ×0.5 cost.

Encryption (TL6). Radios are often mated directly to cipher machines (p. 211) or have built-in computer encryption (p. 211). Simply add costs and weights.

Radio Direction Finder (RDF) (TL6). This device is designed to intercept and pinpoint radio broadcasts. It can receive transmissions on any civilian, police, or military frequency. To get a fix on a broadcasting radio, the user

Radio in Use

The ranges given for radios assume *routine* use. Many factors can affect the actual range of radio communication.

Extending Range

Radio signals propagate farther than the "effective ranges" listed – and a skilled operator can pick them up. Make an Electronics Operation (Comm) roll at -1 per 10% added to range, to a maximum extension of 100%. Some radios can use "short wave" frequencies to enjoy *global* range, as noted for the Short Wave modifier on p. B91.

Range and Bandwidth

When transmitting data or code groups (Morse code, recorded audio-video, etc.), it's possible to lower the transfer rate or "bandwidth" and use message repetition to significantly boost range: 1/4 speed gives 2× range; 1/100 speed gives 10× range, 1/10,000 speed gives 100× range, and so on. This technique is often used for ship-to-shore communication at TL6, and for deep-space transmission at TL7-8.

Radios with Different Ranges

The listed ranges assume that transmitter and receiver have the same range. If this isn't true, an extra step is required. Radios are rated by size: *large, medium, small,* or *tiny.* To determine the range at which two radios with *differing* ranges can communicate, start with the range of the *shortest*-ranged radio and modify it for the size difference in as follows:

Size Difference	*Modified Range*
One size greater	3× shorter range
Two sizes greater	10× shorter range
Three sizes greater	30× shorter range

Example: Nat is flying a plane equipped with a TL8 large radio (200-mile range). Airk tries to contact him with a TL8 small radio (5-mile range). Can they communicate? The shorter range is 5 miles, but the large radio being two sizes greater gives ×10. That's a 50-mile range. Provided the radios are no more than 50 miles apart, no skill roll is needed to extend range.

Other Factors

Range may drop to as little as 1/10 usual in an urban environment or underground. Also divide range by 10 when transmitting real-time video or audio-video.

must *win* a Quick Contest of Electronics Operation (Comm) with the transmitter's operator. Victory reveals the general distance and direction to the radio; a margin of 5 or more gives an exact location. The GM may allow repeated attempts once per minute or so. This option is often but not always combined with "receive-only." ×5 cost.

Radio Intercept (TL6). This is specialized equipment for conducting radio eavesdropping (p. 209). It has large precision tuning dials, a sophisticated antenna array, and so on. At higher TLs, it's highly automated but can still be spoofed by ECCM-equipped radios (see below). It uses the Electronics Operation (EW) skill (p. B189). ×5 cost.

Radiotelephone (TL6). A predecessor of the cellular phone (see below), this adds special equipment so that a radio receiver that's physically linked to a telephone line can route its transmissions over the telephone system. ×1.5 cost.

Receive-Only (TL6). A radio can be built only to receive messages. ×0.1 cost, ×0.2 weight.

ECCM (TL7). The radio uses frequency-hopping to make its transmissions hard to jam or intercept. When communicating with another radio synchronized to use the same settings, this prevents any interference from selective radio jammers. It has no effect against noise jamming. A radio with ECCM can be detected at 1.5× its range at most (as opposed to at 2× range). ×2 cost.

GPS (TL8). The radio has an internal GPS unit (p. 53) and a small map display. When two radios like this communicate, their relative locations are marked on a display screen. ×2 cost.

Satellite Uplink (TL8). Only for medium and large radios. This allows the radio to reach any other radio in the world via communications satellite. ×2 cost.

Radio Accessories (TL6)

Radios can be fitted with many gizmos. None of these include the *radio* – buy that separately!

Headsets and Microphones (TL6)

Earphones allow a radio operator to more easily understand radio traffic in a loud environment, while a wearable mike makes it easier for others to make out what *he* is saying to *them*.

Headphones and Throat Mike (TL6). Vehicle crewmen (fighter pilots, tankers, etc.) wear headphones and a throat mike. The throat mike detects vibrations from the voice box, which prevents noise from the vehicle from garbling the message. Weight becomes negligible at TL8. $500, 2 lbs. LC4.

Ear Microphone System (TL8). A thin cable connects a single "earbud" to the radio. This earpiece acts as both earphone and mike (via bone induction), allowing the operator to subvocalize and avoid detection in a crowd. $500, 0.25 lb., T/72 hrs. LC3.

Tactical Headset (TL8). Soldiers and SWAT officers prefer a hands-free, voice-activated boom microphone set to transmit whispers, but not screams or the sounds of battle. Headphones or earbuds keep nearby enemies (or civilians) from hearing the conversation. Earbuds double as hearing protection (p. 70). $200, 1 lb. LC4.

Wireless Earphone (TL8). A tiny earpiece picks up audio signals from a short-range transmitter box connected to the radio. The voice-activated microphone is worn like a necklace, and is concealable under normal clothing. $300, 0.5 lb., T/72 hrs. LC3.

Long-Range Antenna (TL6)

Radio range benefits greatly from a more extensive antenna array than the short "whip" found on most portable radios. A large antenna takes at least 5 minutes to erect but doubles the radio's maximum range. Roll against Electronics Operation (Comm) skill to set up and tune the equipment properly. Cost and weight are 25% of the cost and weight of the radio for which it's intended.

Cell Phones (TL8)

At TL8, radiotelephones connect to landline telephone trunks via networks of automated radio towers. Each tower acts as a node, or *cell,* and as the mobile radio moves between zones, the connection is passed from cell to cell – whence "cellular network." Of course, in an area without a network, a cell phone can't make or receive calls!

Early cell phones are simply phones. Later models are brimming with functions that even the most demanding adventurer would appreciate. These include voice recognition (allowing hands-free use), push-to-talk radio (for free phone-to-phone service), GPS, digital cameras (still and video), digital music players (with enough memory for hours of music), video games, and customized ring tones. Modern cell phones often have built-in wireless interconnectivity, too. A phone like this can connect directly to a nearby computer – usually a PDA or a laptop – and serve as a modem. Such "kitchen sink" devices make it difficult to distinguish between a cell phone and a full-featured PDA.

Cell-phone gadgetry is tiny and lacks proper ergonomic controls; using it can be frustrating. The GM may wish to penalize such skills as Computer Operation, Navigation, and Photography when using appropriately equipped cell phones. A phone might count as basic equipment in absolutely mundane situations, but it's probably no better than improvised equipment (-5 quality) the rest of the time. To reduce the penalty, the operator must spend extra time fiddling with the controls (see *Time Spent,* p. B346).

Cell phone service costs $50 a month. Prices per minute vary from outrageous, for so-called "roaming charges," to free.

Early Cellular Phone (TL8). A big "brick," with 15-30 minutes of talk time. $4,000, 2 lbs., S/30 minutes. LC4.

Cellular Phone (TL8). A sleek, modern phone, with a few extra functions. Good- and fine-quality phones have more features. The battery lasts for several hours of talk time and perhaps a week on standby. $100, 0.5 lb., S/6 hrs. LC4.

Satellite Phones (TL8)

Also at TL8, portable radiotelephones can connect to landline telephone networks via communications satellite. Such phones can make calls from anywhere in the world! Service costs $50 a month . . . plus $1-2 a *minute.*

He accordingly set the phonograph at a slow pace, and I began to typewrite from the beginning of the seventeenth cylinder.
– Mina Harker, ***Dracula***

Satellite Phone (TL8). In addition to normal cell-phone service (and many of the features common to cell phones, above), this phone can relay calls through a communications satellite to reach any other phone in the world. It can also act as a modem for a computer. $1,000, 1 lb., S/4 hrs. LC4.

Satellite Videoconferencing System (TL8). A satellite phone and video screen built into a rugged, waterproof suitcase. It can transmit live video from a digital video source or use its built-in camera for videoconferencing. $10,000, 10 lbs., external power. LC4.

Other Communications

Landlines and radios are the most popular means of communicating over long distances at TL5-8, but other options exist.

Heliograph (TL5)

The heliograph consists of a mirror-and-shutter apparatus atop a tripod. In sunny conditions, it can flash a signal across 30 miles, terrain permitting. The U.S. Cavalry occasionally transmitted from mountaintop to mountaintop, achieving distances in excess of *150* miles! Anyone might see the signals, but they can be encoded or enciphered. Heliographs are generally available after 1850. $100, 50 lbs. LC4.

Pocket Laser Communicator (TL8)

This device uses a near-infrared laser beam to transmit signals – usually voice messages. The communicator consists of a headset and a transmitter the size of a miniature flashlight, both of which plug into a cassette-tape-sized receiver worn on the body. The unit also doubles as an IR flashlight (p. 47).

The communicator can operate in two modes: *narrow-beam* and *wide-beam*. Narrow-beam mode requires line of sight, but the communicator cannot be jammed or intercepted except by enemies directly in the beam path. Effective range is about 1 mile. In wide-beam mode, the signal is broadcast (this requires no line of sight if indoors) and thus can be intercepted; range is about 0.5 mile. $1,000, 0.75 lb., VS/4 hrs. LC4.

Underwater Communicator (TL8)

Sometimes called a "divecom," this special sonar transmitter allows voice and data communications underwater. It has fittings for use with a full-face dive mask (p. 71). Divers can talk freely with each other, while those on the surface must use a base station to communicate with the divers. Hydrophones (p. 49) and sonar (pp. 45-46) can easily detect the signals. Like radio, adverse conditions (in this case, fast currents, thermal boundaries, etc.) can reduce range to 1/10 normal.

Divecom Base Station (TL8). A surface base station, mounted on a boat, pier, etc. It only works while its transceiver array is in the water. $3,000, 10 lbs., external power. LC3.

Diver Communicator (TL8). The civilian version has a range of up to 3,000 yards. The military version has built-in encryption and double the range, but cost and weight are ×3. $1,000, 1 lb., S/4 hrs. LC4.

Media

At TL5-8, many technologies emerge for recording and playing back audio and video content – whether for education, entertainment, or propaganda. These aren't the only media, of course. See *Information Technology* (pp. 17-22) for print media and computers, and *Communications* (pp. 35-40) for broadcasting equipment.

Audio Storage, Recording, and Playback

At TL5-7, audio storage means hardcopy – records, tapes, etc. An 8'×10' shelf filled with standard 12" LPs would hold about 5,500 albums. That's *two tons* of vinyl.

At TL8, audio storage and retrieval make staggering gains. The shelf mentioned above, for instance, would hold 28,000 albums on compact disc. That same 2.5 TB of music could be stored in a hard drive smaller than a shoebox.

Like all of ***High-Tech,*** the list below is representative, not encyclopedic – it's merely a small sampling of what's possible. Prices assume basic, consumer-grade equipment. High-fidelity and professional equipment should be of good or better quality (p. B345).

Audio Accessories (TL6)

Proper headphones are basic equipment for Connoisseur (Music). Electronics Operation (Media) also requires a microphone. Treat the lighter versions included with communications gear as improvised: -2 to -5 (quality)

to skill and to Hearing rolls made for fine details. These devices are powered by the attached hardware.

Headphones (TL6). At TL7-8, these deliver very high-quality sound. $50, 1 lb. LC4.

Microphone (TL6). At TL8, halve price and divide weight by three. $100, 3 lbs. LC4.

Phonograph (TL6)

Thomas Edison founded the Edison Phonograph Company in 1887 to market the first practical audio recording device. The phonograph is a tabletop apparatus about the size of breadbox. The user speaks into the "listening horn," which transports the sound through a metal tube to a writing apparatus, the "scribe." The scribe travels along a track, etching groves in a spinning cylinder of wax-coated cardboard. When the scribe reaches the end of the track, the cylinder is full and the device stops. Continued recording requires replacing the cylinder with a fresh one. Some models are powered by a hand crank, others by electricity. $2,000, 30 lbs., external power. LC4.

A cylinder-shaving machine allows one to reuse the wax-covered cylinders by shaving them smooth, thereby erasing the recording. This has the same weight and cost as the phonograph itself.

Record Players (TL6)

The "gramophone" is essentially Edison's phonograph using a disc instead of a cylinder. Early models have a hand-cranked clockwork mechanism to spin the turntable and a brass horn for playback; records are made of wax at first, and then vinyl. Later models use electricity and have far better sound quality. Play time is initially very short, but increases dramatically as records grow in size and the groove becomes smaller (*microgroove* records in the 1950s) – a single 12" LP ("long play") record plays for 20-30 minutes per side. At TL8, music labels often produce a small run of old-fashioned vinyl records in homage to the long legs of the LP.

Gramophone (TL6). Records and plays records. Sound quality is terribly poor and scratchy. $500, 40 lbs., external power. LC4.

Pocket Phonograph (TL6). Looks like an oversized pocket watch (4" across) but unfolds to become a hand-cranked record player. The Mikiphone brand was popular, marketed as "A Jazz Band in Your Pocket." Holdout -2. $250, 4 lbs. LC4.

Portable Phonograph (TL6). A hand-cranked record player in a small briefcase – the perfect picnic Victrola. $100, 10 lbs. LC4.

Record Player (TL7). Plays records but doesn't record. $50, 10 lbs., external power. LC4.

Wire Recorder (TL6)

Wire recorders were developed near the end of the 19th century. Early models were similar in appearance to the phonograph, but recorded magnetically to steel wire wrapped around a cylinder. Later models used reels of steel wire or tape, and resembled reel-to-reel tape recorders. By the 1930s, wire recorders could be found in most executive office settings, laboratories, and warships (where they were used to record radio messages for later decryption). A typical recorder is box-shaped, with two reels on top: $1,500, 15 lbs., external power. LC4.

Open Tape Recorders (TL6)

The first practical magnetic tape recorders – called "open tape" or "reel-to-reel" recorders – were built by AEG in Germany in 1935. By the early 1950s, magnetic tape recorders were the standard audio recording technology. In the 1960s, small reel-to-reel recorders were used as "body wires" for espionage and police work . . . and each episode of the *Mission Impossible* TV series began with a miniaturized recorder offering Jim Phelps a new adventure!

Magnetic Tape Recorder (TL6). $8,500, 100 lbs., external power. LC4.

Reel-to-Reel Tape Recorder (TL7). $150, 10 lbs., external power. LC4.

Reel-to-Reel Tape Recorder, Miniature (TL7). Miny-reel lasts 1 hour. Holdout -1. $500, 1 lb., 2×XS/5 hrs. LC3.

Mechanical Music (TL6)

Machines capable of playing music without a musician date back to the 1750s, but such contraptions were neither user-friendly nor accessible to the general public until around 1900, when the first "player pianos" came on the market. The most common type used a vacuum pump – hand-cranked or electric – to control an otherwise-normal upright piano. A roll of punched paper provided the music ($5, neg.). Such pianos remained popular until the Radio Era began in the late 1920s. $6,000, 600 lbs., external power. LC4.

Cassette Players/Recorders (TL7)

Tape recorders that used compact tape cassettes entered the market in 1964, offering unparalleled portability and ease of use. The technology's TL8 incarnation was Sony's Walkman – a small, personal, *stereo* cassette player, first sold in 1979.

Cassette Recorder (TL7). A portable player/recorder, about as large as a mid-sized book. $150, 3 lbs., 5×S/8 hrs. LC4.

Handheld Cassette Recorder (TL8). A pocket-sized player/recorder with an AM/FM tuner. $10, 0.5 lb., XS/36 hrs. LC4.

Compact Disc Players (TL8)

Compact disc (CD) players went on sale in 1982. Sony beat CD development partner Phillips to the punch, selling their product one month earlier than Phillips. Portable players followed in 1985.

Compact Disc Player (TL8). A CD-player console, with AM/FM tuner, etc. $900, 15 lbs., external power. LC4.

Portable Compact Disc Player (TL8). A "walkman" style CD player. Later models have FM tuner, "anti-skip," etc. $25, 0.5 lb., 2×XS/75 hrs. LC4.

Digital Media Player (TL8)

Digital media players are tiny audio-playback devices, typified by Apple's iPod. The first were the size of a pack of cigarettes, but recent models are the size of a pack of gum – and prices have likewise shrunk, from expensive to affordable. All play audio content converted to (or, increasingly, *recorded* in) compressed digital formats: MPEG, MP3, etc. With gigabytes of storage, they can hold hundreds to thousands of songs. The rechargeable batteries last for at least 12 hours. Higher-quality versions (p. B345) support more formats, store more songs, and/or include such features as audio recording, wireless connectivity, and video playback. $100, 0.25 lb. LC4.

Audio Storage Media

Secrets stored this way could be the MacGuffin that drives an adventure.

12" LP (TL6). Plays 20-30 minutes per side. $15, 0.5 lb. LC4.

5.5" Record (TL6). One of the first popular collectable records, these "Little Wonders" played about 90 *seconds* of music per side. $1.50, 0.25 lb. LC4.

Wax Cylinder (TL6). Holds about 10 minutes of scratchy, poor-quality audio. Holdout -2. $5, 0.25 lb. LC4.

Wire Reel (TL6). Holds about an hour of poor-quality audio. Holdout -1. $15, 0.5 lb. LC4.

Audio Cassette Tape (TL7). A plastic cassette holding 30-60 minutes of music (660 KB of data) per side. Holdout 0. $1, 7 weigh 1 lb. LC4.

Reel-to-Reel Tape (TL7). The most common reel at TL7 is a 1,200' length of 1/4" tape on a 7" reel, which holds about an hour of standard audio or 15 minutes of professional-quality recording. $3, 1 lb. LC4.

Compact Disk (TL8). A single CD holds 74-90 minutes of audio (650-800 MB of data). Holdout 0. $0.50, 15 weigh 1 lb. LC4.

Video Storage, Recording, and Playback

At TL5, the photographer surpasses the portrait artist as society's recorder of visual images. While an artist charges upward of $100 for the week-long process of painting a portrait in oils, a photograph soon drops from $100 to $5, and seldom takes longer than an hour.

At TL6, photography is no longer so complicated that it requires a professional. Toward the end of TL6, most high schools offer photography classes, while mail-order catalogs hawk cheap developing equipment, film, and cameras. By the dawn of TL7, even the most remote backwater usually has inexpensive cameras and film for sale. At TL8, video storage – like audio storage (p. 42) – benefits greatly from digitization; pictures stored on computer or CD can be printed at home at the touch of a button.

Use the Photography skill (p. B213) to take good pictures, develop film, or use TL8 image-editing software. Roll at -3 for *moving* pictures.

Camera Obscura (TL5)

The camera obscura is simply a box with a lens fitted to a drawer in the front. A mirror at the back of the box reflects the image upward, where the artist can trace it on paper. To focus, the operator slides the drawer in and out. While not a camera in the modern sense, this device was one of the first means of capturing an exact copy of an image. Itinerant artists often used it to produce drawings of homes and architecture for a small fee. Meriwether Lewis berated himself for not taking one along during the exploration of the Louisiana Purchase in 1804-1806. Use Artist (Drawing) skill to make an accurate or attractive copy. $50, 10 lbs. LC4.

Wet-Plate Camera (TL5)

Cameras of the 1840s relied on one of several chemical processes to prepare a plate of glass ("daguerreotype" or "ambrotype") or metal ("ferrotype" or "tintype") to receive an image. The wet-plate collodion process was the most widespread by the early 1850s. It remained the mainstay of photography until the turn of the century.

In the wet-plate process, the chemical-treated plate serves as the negative for printmaking – much like modern film. The photographer prepares the plate in a darkroom or a tent, working by the light of a lantern with a red glass or silk cover. He immerses the plate in a chemical bath to render it light-sensitive, removes it, puts it into a lightproof carrier, and attaches this to the back of the camera. To take a photograph, he removes the carrier's front panel and the lens cap, exposing the plate to light for 15 seconds or more before replacing the cap. (This exposure time explains why period photographs often depict people sitting or leaning – and why action shots are impossible.) He then takes the sealed carrier back to the darkroom and makes prints on special photosensitive paper.

Developing Equipment (TL5). Enough chemicals and containers for developing a few hundred wet-plate images and accompanying prints. Many of the chemicals are flammable or poisonous! $300, 25 lbs. LC4.

Glass Plates (TL5). A common 5"×8" glass plate. $5, 0.5 lb. LC4.

Wet-Plate Camera (TL5). A camera and tripod. $1,000, 50 lbs. LC4.

Box Camera (TL6)

In 1888, George Eastman introduced the first consumer-friendly camera with the slogan "You press the button, we do the rest." His Kodak camera created the amateur photographer. The later Brownie (1900) was light and simple enough for a child to use; Ansel Adams' first camera was a Brownie, given to him at age 14.

A box camera uses photographic film. Once the film is used up, the whole camera is sent off to the lab. After 4-6 weeks, it's returned with the prints and ready to shoot again. Professionals with access to a darkroom (p. 43) can

develop the film and reload the camera themselves. Holds 6-12 exposures. $20, 0.5 lb. LC4.

Movie Camera (TL6)

The Bell & Howell Filmo was the archetypical movie camera of TL6. During WWII, U.S. Army combat cameramen carried it – and machines like it – from Bougainville to Berlin.

To use the camera, the operator loads a film cassette with a reel of film inside and then winds the clockwork mechanism (takes 15 seconds). The camera is then ready for about 30 seconds of filming before it must be rewound. Electric motors or a hand-turned crank can also power the camera, if it's mounted on a tripod (see below). Halve cost and weight at TL7-8. $2,500, 6 lbs., external power. LC4.

SLR Camera (TL6)

The first 35mm single-lens reflex (SLR) cameras – such as the Leica and Kine Exacta – became available during the 1930s. Nikon and Canon quickly followed with their own versions. Variations on the theme are still popular today.

The main advantage of the SLR is that the viewfinder is the camera lens. This cuts down on getting fingers in the way of the lens, leaving the subject's head out of the frame, etc. Expensive, higher-quality systems (p. B345) provide a bonus to Photography skill. $400, 3 lbs. LC4.

Subminiature Camera (TL6)

A subminiature camera such as the Minox is as likely to be used for vacation photos as for clandestine purposes. Its reputation as a professional "spy camera" is a consequence of its size – about 2" long by 1" wide – and the fact that its tiny lens can focus at sufficiently close range to photograph documents. It takes from 12 to 50 exposures per roll of film. At TL8, digital versions record to a digital storage device (p. 22) instead. Holdout +2. $500, 0.1 lb. LC4.

Video Accessories (TL6)

These are just a few of the *many* accessories available to TL6-8 photographers.

Camera Bag (TL6). Holds camera, lenses, film, cleaning gear, etc. $25, 1 lb. LC4.

Darkroom (TL6). All the equipment needed to develop film. Higher-quality equipment can develop unusual film (UV, IR, etc.), produce professional-quality prints and enlargements, and so on. $500, 25 lbs. LC4.

Telephoto Lens (TL6). 30× magnification. $500, 8.5 lbs. LC4.

Tripod (TL6). Stands 4' tall, but collapses to 12". Divide weight by 3 at TL8. $75, 9 lbs. LC4.

Underwater Housing (TL7). An airtight plastic shell (DR 2) for a camera, allowing full access to all controls. $200, 1 lb. LC4.

Wireless Pan-Tilt-Zoom (TL8). A motorized aiming system that's mounted on a tripod and operated by remote control. $1,000, 3 lbs., 3×S/10 hrs. LC4.

Watch Camera (TL6)

The Expo Watch Camera was introduced in 1905 – one of many miniature cameras offered around the turn of the century. Its pocket-watch size makes it difficult to operate: -3 to skill. It uses a miniature roll of film that holds 25 exposures ($2.50, neg.). Holdout +2. $25, neg. LC4.

VHS Camcorder (TL8)

The early 1980s brought the VHS (Video Home System) movie camera that stored images on magnetic tape. The compact VHS (VHS-C) camera followed shortly afterward, at 1/4 weight! By the early 1990s, most camcorders had LCD displays rather than viewfinders.

Common features on VHS cameras include an on-camera microphone and a removable spotlight. More expensive models use active night vision (pp. 47-48) and accept specialized lenses (telephoto, wide-angle, etc.) like those used by SLR cameras (see above). $1,500, 8 lbs., M/2 hrs. LC4.

Digital Camcorders (TL8)

The first digital camcorders appear in the mid-1990s. A given model might store video on a digital storage device (p. 22), DVD, or mini-DV cassette tape.

Micro-Camcorder (TL8): A digital camera about the size of a deck of playing cards. It records to a digital storage device – about one hour of video on a 256 MB card. The rechargeable battery lasts for 1 hour. Holdout +1. $200, 0.25 lb. LC4.

Mini-DV Camera (TL8). A compact digital movie camera with built-in features that give Night Vision 3 and Telescopic Vision 2. It has a small LCD screen and can take digital stills. The rechargeable battery lasts for 1 hour. $500, 1 lb. LC4.

Professional Mini-DV Camera (TL8). A larger and heavier professional camera with an array of filters and lenses (including wide-angle and telephoto), a shotgun microphone, and other accessories. It gives +2 (quality) to Photography skill. The rechargeable battery lasts for 90 minutes. $10,000, 8 lbs. LC4.

> *I am experimenting upon an instrument which does for the Eye what the phonograph does for the Ear.*
>
> *– Thomas Edison, October 17, 1888*

Digital Camera (TL8)

A digital camera stores color images on a removable digital storage device (p. 22) instead of on film, the exact number depending on image quality and the size of the storage device. It can transfer images directly to computer without any quality loss from scanning. Cheap digital cameras are often quite small (Holdout 0). $75, 0.5 lb., 2×XS/10 hrs. LC4.

Digital Video Recorder (TL8)

A DVR is simply a computer equipped with a $50 adapter and running special Complexity 2 software; see *Computers* (pp. 19-22) for hardware and software prices. It can record TV broadcasts or camera input. Each hour of recording requires 1 GB of storage. Such setups are rapidly supplanting VHS at high-security facilities. A DVR connected to a computer network allows remote access to security-camera footage – live or recorded.

Video Storage Media

Photographers, detectives, and spies should bring along a good supply of these items. Without them, a camera is at best an expensive monocular!

Film (TL6). Regular or high-speed film for a 35mm SLR or similar. 24-36 exposures/roll. Holdout +1. $2, neg. LC4.

Infrared Film (TL6). Lets normal cameras take pictures in Infravision (p. B60). "Color" versions appear at TL7. 24-36 exposures/roll. $30, neg. LC4.

Movie Camera Film (TL6). A 100' reel of film. Lasts 4-6 minutes. Holdout -3. $30, 0.5 lb. LC4.

Ultraviolet Film (TL6). Lets normal cameras take pictures in Ultravision (p. B94). "Color" versions are available at TL7. 24-36 exposures/roll. $100, neg. LC4.

Digital Versatile Disc (TL8). A DVD holds from 120 minutes (4.7 GB) to 240 minutes (8.5 GB), depending on format. Holdout 0. $2, neg. LC4.

Mini-DV Cassette (TL8). A tape cassette that stores about 80 minutes of digital video. Holdout -1. $6, 0.25 lb. LC4.

VHS Cassette (TL8). Holds 800' of tape. Records for 2-3 hours. Holdout 0. $2, 0.5 lb. LC4.

Broadcast Radio

Radio receivers intended for ordinary consumers appeared in the early 1920s. By 1929, radio broadcasts were reaching 10 million Americans. The 1930s were the Radio Age, with listeners faithfully tuning into shows like *Amos 'n' Andy, The Shadow,* and *Little Orphan Annie.*

The radio wasn't just a home appliance. Motorola sold its first automobile radio receiver in 1930. Many police departments installed such hardware in "radio cars" that could listen to dispatch but not respond ("Calling all cars!"), as did big-city taxi companies.

World War II rocketed radio to dizzying heights . . . only to see it crash in the 1950s, eclipsed by the television boom. The top three U.S. radio stations sold over $130 million in advertising spots in 1945, but managed only $64 million in 1955. Today, *satellite* radio gives broadcasters global reach and brings consumers the widest variety of content in radio's history.

Radio Sets (TL6)

At TL6 and early TL7, a radio is vital for spies keeping up with current events, vigilantes monitoring police traffic, resistance fighters waiting for coded orders, and other adventurers. A radio might even pick up messages from aliens, the spirit world, the past, or the future!

Cabinet Radio (TL6). A typical radio of the 1920s, in a huge cabinet the size of kitchen stove. It comes on with a hum and frequently drops the station, requiring constant fiddling. $1,500, 150 lbs., external power. LC4.

Transistor Radio (TL7). An AM/FM radio the size of a cigarette pack. $15, 0.5 lb., S/10 hrs. LC4.

Boom Box (TL8). An AM/FM radio with cassette, CD player, etc. Loud enough to rock the block! $100, 15 lbs., 6×S/5 hrs. LC4.

Satellite Radio Receiver (TL8). A pocket-sized satellite radio receiver. Service costs $10 a month. $50, 0.5 lb., XS/5 hrs. LC4.

Television

Television broadcasts were experimental throughout the 1920s. Television sets were being sold commercially by 1938, but the phenomenon didn't take off until the early 1950s. Less than 200,000 TV sets were produced in the U.S. in 1947. By 1953, that number had leapt to 7 million. In a historical game, it would be fair to regard television as a late-TL6 technology that doesn't enjoy commercial success until TL7.

Television Sets (TL6)

Television sets can be an important source of news during a campaign, taking over from radio in TL7. A TV might also be the voice of supernatural things from beyond, as in the film *Poltergeist*.

Early TV Set (TL6). A tiny monochrome display a few inches across, in a massive mahogany cabinet. $4,000, 150 lbs, external power. LC4.

TV Set (TL7). A 15" black-and-white display. A color TV has ×10 cost! $500, 150 lbs., external power. LC4.

Portable TV (TL8). A 7" flat-panel color TV and DVD player with speakers, antenna, and power adapter. The rechargeable battery lasts 4 hours. $100, 2 lbs. LC4.

TV Set (TL8). A 42" flat-panel, high-definition color TV. $1,500, 100 lbs., external power. LC4.

TV Watch (TL8). The first wrist-mounted TV was sold by Seiko in 1982; it had a tiny 1.5" screen connected by a cable to a separate "shirt pocket receiver" (0.5 lb., 2×XS/5 hrs.) and headphones. Newer versions dispense with the separate receiver and are truly self-contained wrist-top TV sets. Headphones plug into the watch, which runs for a little over an hour on its rechargeable battery. $200, neg. LC4.

Television Accessories (TL7)

Adventurers might use these devices to replay news stories, mission-rehearsal tapes, or crimes caught on camera.

TV Recorder (TL7). The first *home* television recorder was marketed in 1965. It recorded to open-reel video tape. By today's standards, picture quality was poor. $3,500, 35 lbs., external power. LC4.

VHS Recorder (TL7). The videocassette recorder (VCR) appears in the mid-1970s. Records on VHS tape. $5,000, 10 lbs., external power. LC4.

DVD Player (TL8). A standard model with remote control. $80, 10 lbs., external power. LC4.

DVD Recorder (TL8). This can record directly from TV to DVD – or from a VCR tape to DVD, or vice versa. $200, 10 lbs., external power. LC4.

VHS Recorder (TL8). A modern VCR with remote control. $50, 5 lbs., external power. LC4.

Sensors and Scientific Gear

A bewildering array of technology is available to detect virtually anything – from atoms to galaxies.

Active Sensors

Active sensors detect objects by bouncing energy off them and analyzing the returned signal. Radar emits radio or microwaves, sonar uses sound, etc. All such sensors incorporate display panels or terminals that translate the raw data into a comprehensible image.

Active sensors are rated for sensor type and range. Detecting hidden targets or resolving fine detail requires an Electronics Operation roll; the specialty depends on the sensor (see p. B189). This is at no range penalty out to the sensor's rated range. Each *doubling* of range beyond that gives -2 to skill.

Rolls are only allowed against targets within the sensor's arc. Unless otherwise noted, assume that active sensors scan a 120° arc in front of them. In effect, they have No Peripheral Vision (p. B151).

Specialized detectors within an active sensor's arc can detect the energy that the sensor emits at up to twice the sensor's range. The signal doesn't simply vanish at that distance, of course – sensitive detectors may sense it from much further away. Each type of sensor requires a different kind of detector.

Targeting Mode: Expensive combat-capable or "tactical" sensors incorporate a "target-acquisition" or "fire-control" mode, which works identically for all active sensors: The sensor generates a narrow targeting beam. It requires an Aim maneuver to "lock onto" a target that has already been detected. The sensor then acts as a rangefinder, determining the target's precise range and speed. This gives +3 to hit with an aimed ranged attack – cumulative with the benefits of targeting software.

Sonar (TL6)

Sonar (*s*ound *n*avigation *a*nd *r*anging) uses ultrasonic sound waves to detect underwater objects and determine their general shape. The term is courtesy of the WWII-era U.S. Navy. As far back as 1917, the British called this technology "ASDIC" in honor of the Anti-Submarine Detection Investigation Committee, the group responsible for adopting sound-based standards of submarine detection.

In addition to watching a display screen, most sonar operators wear headphones that let them listen for audible clues about the object being "pinged" by the sonar. Make an Electronics Operation (Sonar) roll to detect or identify an object. Ambient noise from sea life and other ships interferes with detection, giving from -1 when near noisy whales to -6 when trying to detect something in a busy harbor. Sonar can also be "jammed" or fooled by an extremely loud noise (e.g., an explosion).

Individuals or devices with Ultrahearing (p. B94) can detect sonar.

Large Sonar (TL6). A powerful sonar suite and workstation, found aboard military vessels (patrol boats, submarines, etc.) or in a fixed station for harbor defense. Range is 4,000 yards at TL6, 8,000 yards at TL7, and 20,000 yards at TL8. $2,000,000, 1 ton, external power. LC4.

Medium Sonar (TL8). Sonar used by small boats or deep-sea salvage divers. The diver-operated version looks like a scuba tank with a display screen on the rear. Range is 2,000 yards. $15,000, 50 lbs., 12×L/4 hrs. LC4.

Small Sonar (TL8). A handheld sonar unit that resembles a megaphone. It's used by divers to detect underwater mines, drowning victims, discarded murder weapons, etc. Range is 100 yards. $2,000, 8 lbs., 8×S/20 hrs. LC4.

Special Sonar Modes (TL6)

Tactical (TL6). Medium and large sonar can be bought with a military-style targeting mode. This can track and identify up to 10 targets at once out to the listed range, and give +3 to hit any of them with an aimed attack. ×5 cost. LC2.

Imaging (TL8). At TL8, high-frequency sonar can render fine surface detail rather than merely revealing an object's general shape. This allows sub-bottom profiling to detect objects beneath the floor of a body of water, much like ground penetrating radar (see right). Range is 1/10 normal. ×5 cost, ×2 weight. LC2.

Radar (TL7)

Radar (*ra*dio *d*etection *a*nd *r*anging) uses high-frequency radio or microwaves to render an image of a distant object. Britain, Germany, and the U.S. developed it simultaneously and independently in the 1930s. The first true demonstration of radar's capability was the defeat of the *Luftwaffe* during the Battle of Britain in 1941, thanks to the Chain Home radar network. Radar has played a significant role in almost every military operation since then. Today's radars are smaller (often man-portable) and more powerful.

Radar indicates target speed, altitude, position, and approximate size. The GM can assume that radar *automatically* spots most moving targets that are in range and that fit its criteria. If a target is using radar countermeasures or being stealthy, though, the radar operator must *win* a Quick Contest of Electronics Operation (Sensors) skill against the Electronics Operation (EW) skill of an intruder with a jammer or the Stealth skill of an infiltrator on foot.

Radar is unimpaired by darkness, smoke, and bad weather, but it can't see over the horizon, through solid obstacles, or underwater. It can't discriminate between a moving human and a moving animal or vehicle of similar size. Background items make spotting stationary human-sized or smaller objects on the ground practically impossible in anything but open terrain. Assume that the operator can't distinguish nonmoving targets from "ground clutter" unless he previously saw that particular "blip" moving.

Large Radar (TL7). A 100-mile range radar *station* for surface-to-air missile sites, airports, warships, or search aircraft. It consists of a large tower or radome, a cabinet full of equipment, and 1-3 workstations. $1,000,000, 10 tons, external power. LC3.

Medium Radar (TL7). A 15-mile range radar mounted on a tripod or a vehicle. $50,000, 100 lbs., external power. LC3.

Small Radar (TL7). A 3-mile range radar, typical of those found on marine vessels, civilian aircraft, and ground vehicles used by "storm chasers." $10,000, 30 lbs., external power. LC3.

In all cases, double range and halve weight at TL8.

Special Radar Modes (TL8)

The radars above (but *not* ground-penetrating or thru-wall radar) can be bought with these modes:

Low-Probability Intercept (TL8). LPI radar uses rapid, frequency-agile bursts of energy. This halves range, but the signal can only be detected at 1.5 times the *halved* range (instead of at twice the usual range). ×5 cost. LC2.

Tactical (TL8). This is military-style targeting radar. It can track up to 10 targets at once out to the listed range, identify their general class at 1/10 that range, and give +3 to hit any of them with an aimed attack. ×5 cost. LC2.

Ground-Penetrating Radar (GPR) (TL8)

This is Imaging Radar (p. B81) tuned to produce a subsurface scan that shows the *inside* of an object. It can locate old roads, burial grounds, buried pipes and wires, caverns, land mines, and long-buried treasure. In 1988, a search team using a GPR successfully located "The Lost Squadron": a flight of eight Lockheed P-38 fighters abandoned in Greenland in 1942. A recovery crew worked for three months to dig one of the P-38s out of nearly *90 yards* of ice. The old warbird, dubbed *Glacier Girl,* was fully restored and flew again in 2002.

Object detection depends on many factors, including the composition and alignment of the object under scrutiny, and the material around it. In general, a GPR gets ×20 range in ice but only ×0.1 range in concrete or rock. A successful Electronics Operation (Scientific) roll can deduce the type of soil or the distance to bedrock, or detect buried items. Suitable software tools (p. 2) can generate 3D images from the data.

Handheld GPR (TL8). A ground-penetrating radar the size of a hardback book. It has a range of 1'. A 2" LCD screen is built into the top of the unit. A digital storage device (p. 22) records data. The internal rechargeable battery lasts for 2 hours. $10,000, 3 lbs. LC4.

Portable GPR (TL8). A shoebox-sized radar unit connected to a color LCD screen. It has a 10-yard range. The operator drags the radar across the ground while watching the screen. The internal rechargeable battery lasts for 2 hours. $50,000, 30 lbs. LC4.

Thru-Wall Radar (TL8)

Like ground-penetrating radar, this specially tuned radar can see through solid objects and into the space beyond. An example is the law-enforcement and security tool marketed as Soldier Vision. It can see through a wall a foot thick (wood, brick, gypsum, etc.) and detect a person 20 yards beyond that. Its range is less than 1' through

concrete, however. It uses Electronics Operation (Surveillance) skill. The rechargeable battery lasts 3 hours. $30,000, 10 lbs. LC3.

Passive Visual Sensors

Throughout TL5-6, "passive visual sensors" means the Mark I Eyeball, assisted by ever-improving optics. At TL7, sensors appear that work like normal vision but extend the limits of human sight. In particular, great advances are made in the area of night vision.

The most common feature of passive sensors is telescopic magnification. Each doubling of magnification lets the user ignore -1 in range penalties on Vision rolls while using the sensor. The user can also "zoom in" on a particular target by taking an Aim maneuver, which is useful for making a more precise identification. While doing so, each doubling of magnification cancels *-2* in range penalties to see *that one target,* but the sensor provides no bonus to spot other targets.

When comparing real-world sensors to those described here, note that the listed magnifications represent a simplification of a complicated issue. For *most* optics, aperture size and eyepiece magnification define performance. Determining the actual power of a telescope is a tricky proposition, and involves aperture size, focal length, focal ratio, etc.

Most of the sensors listed below can accommodate a camera. This is affixed to the eyepiece for non-electronic optics (*all* TL5-6 hardware). At TL7-8, electronic sensors can be plugged into other electronics using a cable.

All of these devices protect the eye(s) behind them with DR 1.

Optics (TL5)

During the Age of Sail, the telescope was a symbol of authority for military officers – especially *naval* officers. The "spyglass" was a near-constant feature in portraits of such men. Around 1830, binoculars came into use. They replaced the telescope in the field, except for special applications, and were de rigueur among officers in both World Wars.

One danger of optics is lens shine. On a bright day, the telltale glint of field glasses can be seen on a Vision roll. To avoid this, the user must make a Stealth roll. From mid-TL5, hoods that partially obscure the lens are available, granting +4 to Stealth for this purpose.

Binoculars (TL5). An officer's "field glasses." 4× magnification. $100, 4 lbs. LC4.

Spyglass (TL5). A collapsible tube fitted with lenses. Early models were made of brass, often with leather trim. Such a spyglass can be used as a light club – and is fairly well-balanced as a weapon – but will never again be useful as a telescope! 4× magnification. Holdout -2. $25, 2 lbs. LC4.

Binoculars (TL6). 6× magnification. $150, 3 lbs. LC4.

Pocket Spyglass (TL6). 4× magnification. Holdout -1. $5, 0.25 lb. LC4.

Scissors Telescope (TL6). During the trench fighting of WWI, tripod-mounted *stereoscopic* telescopes were used for rangefinding and surveillance. They were standard equipment throughout WWII. Called "donkey ears" or "rabbit ears" by the British, these extend 2' above the observer – well over the ramparts of most earthworks. An optional movie-camera attachment is available. 6× magnification. $1,000, 30 lbs. LC4.

Spotting Scope (TL6). A large scope mounted on a small tripod. The observer must either be prone or place both scope and tripod on a bench. 30× magnification. $300, 10 lbs. LC4.

Military-Grade Binoculars (TL7). From the 1960s, binoculars such as these are often ruggedized (p. 10). 10× magnification. $800, 2.5 lbs. LC4.

Military-Grade Binoculars (TL8). The lenses of modern military binoculars are often coated to protect the eyes from laser light (giving Protected Vision, p. B78) and fitted with anti-reflective screens to reduce lens shine. 10× magnification. $800, 3.5 lbs. LC3.

Stabilized Binoculars (TL8). Some advanced civilian binoculars incorporate mechanical stabilization. This eliminates up to -3 in movement penalties – handy when observing from a vehicle. 10× magnification. $5,000, 4 lbs. LC4.

Night-Vision Optics (TL7)

The earliest night-vision devices were developed in the 1930s – an accidental discovery made during work on television cameras. They were monstrous cabinets that popped and hissed, and produced little more than a blurry image. During WWII, the British, Germans, and Americans all developed their own night-vision equipment, which was further refined throughout the Cold War. Modern systems are lightweight and cheap. They're an essential military and police tool, but also used by wildlife-management personnel, bird watchers, journalists, and sailors.

The devices described below use near-infrared and/or computer-enhanced light-intensification optics to amplify ambient light levels. They're rated for the level of Night Vision (p. B71) they provide. Each level lets the user ignore -1 in combat or vision penalties due to darkness. This has no effect on the -10 for *total* darkness, though. Some viewers offer telescopic magnification as well. In all cases, the user has Colorblindness (p. B127), No Depth Perception (p. B145), and No Peripheral Vision (p. B151) while using the optics.

IR Illumination

Most night-vision optics and thermographs pick up visible *and* infrared wavelengths. An infrared filter placed over a light source such as a flashlight completely blocks the passage of visible light but permits infrared – which is invisible to the naked eye – to shine through. Night-vision gear within such a source's normal range can function even in *total* darkness, and gains two additional levels of artificial Night Vision. However, anybody with night-vision optics or a thermograph will see this "active IR" source as a flashlight or a spotlight, and get +4 to all rolls made to locate it (Vision, Observation, Electronics Operation, etc.).

Early Night-Vision Binoculars (TL7). A primitive night-vision viewer like the top-secret British TABBY device used during the Normandy invasion of 1944. It *requires* an IR illuminator (see *IR Illumination,* p. 47) to be effective. Gives Night Vision 2. $5,000, 3 lbs., 4×XS/20 hrs. LC4.

Night-Vision Binoculars (TL7). A typical vehicle- or tripod-mounted Cold War surveillance device, used from the Berlin Wall to the jungles of Vietnam. Standard equipment aboard AFVs and warships. Gives Night Vision 4. 16× magnification. $15,000, 35 lbs., 4×XS/20 hrs. LC4.

Military Surplus Night-Vision Binoculars (TL8). This is reconditioned "military surplus" hardware, often with older Eastern Bloc components, like that peddled in survivalist magazines. Typically has a built-in IR illuminator (see *IR Illumination,* p. 47). Gives Night Vision 4. $200, 1 lb., 2×XS/30 hrs. LC4.

Night-Vision Binoculars (TL8). Handheld, long-range night-vision binoculars. Gives Night Vision 9. 16× magnification. $6,000, 3 lbs., 2×XS/20 hrs. LC4.

Night Vision Goggles (TL8). Head-mounted goggles – known as "NVGs" or "NODs" – such as the U.S. Army's AN/PVS-7 series, often worn on a flip-up helmet mount. Early versions were issued to helicopter pilots. Gives Night Vision 7-9. $3,500, 1.5 lbs., 2×XS/20 hrs. LC4.

Thermographs (TL7)

Thermographs are devices that detect the infrared spectra emitted by objects at different temperatures and then build up a black-and-white (or more rarely, false-color) image of the environment. The first thermographs – called "forward-looking infrared" (FLIR) – were used on helicopters and fixed-wing gunships in Vietnam. Today, infantrymen, police, firefighters, and high-end security systems all benefit from "thermal imaging" technology.

A thermograph lets the user observe or fight at no darkness penalty, even in absolute darkness, *if* his target emits heat – which is typical of all living beings and most machines and electronics. It gives +2 to all Vision rolls to spot such targets, since their heat stands out from the background. It can also, at no bonus, distinguish targets that are warmer or colder than their surroundings: a running engine, hand prints on a recently handled object, a blood trail in the snow, etc. This grants +3 to Tracking rolls if the trail is no more than an hour old.

Thermal imaging *doesn't* distinguish real colors, which may limit the ability to use some controls, and only allows the user to judge the general size and shape of heat-emitting objects – including living beings. For instance, a scout might have trouble telling two people of the same size apart. Roll at -4 to distinguish objects of similar size and shape. As well, the GM may require a Vision-4 roll to read by reflected heat.

Thermographs have some other drawbacks, too. A sudden flash of heat (e.g., flare, fiery explosion, or infrared laser) can blind them, just as a flash of bright light can blind ordinary vision. Early thermographs are artificially cooled and need 1-2 minutes to reach operational status after being switched on. At mid-TL8, thermographs do away with the bulky cooling system and can be ready in 3-5 *seconds.*

All of the systems below grant the equivalent of Infravision (p. B60), but also give the user Colorblindness (p. B127), No Depth Perception (p. B145), and No Peripheral Vision (p. B151) while in use. Most include some level of telescopic magnification as well.

Thermal-Imaging Sensor (TL7). A long-range thermal telescope of the type found on military aircraft, unmanned aerial vehicles, television helicopters, etc. 32× magnification. $40,000, 50 lbs., external power. LC3.

Mini-Thermal Imager (TL8). A pocket-sized viewer that can be mounted on a weapon, or used as a handheld viewer or – with a helmet mount – a hands-free monocular. $10,000, 1 lb., 2×XS/7 hrs. LC4.

Thermal-Imaging Binoculars (TL8). Used by military, police, border patrols, rescue teams, and others. 8× magnification. $7,000, 3 lbs., 4×XS/4 hrs. LC4.

Thermal-Imaging Goggles (TL8). A thermal-imaging camera mounted on a helmet or a head-strap. 4× magnification. $13,000, 1.5 lbs., XS/2 hrs. LC4.

Thermal-Imaging Surveillance Camera (TL8). A security camera for outdoor surveillance. It's standard equipment at such high-security installations as nuclear power plants. 4× magnification. $7,000, 1 lb., external power. LC4.

Indirect Passive Sensors

New weapons and vehicles fielded in the World Wars spur the development of many *non*-visual passive sensors at TL6. Cold War cat-and-mouse games played with spies, subs, and nukes at TL7 – and efforts to enforce global security at TL8 – ensure that such technologies continue to mature. Except as noted, these detectors are omnidirectional and don't require a line of sight.

Chemical Detectors (TL6)

In April 1915, the Germans released over 150 tons of chlorine gas during the Second Battle of Ypres. French and Algerian troops fled in panic, and the German infantry slogged forward into a gap four miles wide. This was the Western Front's introduction to gas warfare.

At TL6-7, chemical detection relies on reactive papers or powders. At TL8, an "artificial nose" can sniff out chemicals in the atmosphere and notify the operator. Each device is designed to detect a specific class of agents, which might be narrow or very broad.

Chemical Test Kit (TL6). The first detectors are strips of paper treated to react to specific chemicals. They're worn on the sleeve by hazardous-materials workers and soldiers, dipped in suspicious liquids, etc. At TL6, a positive test means the paper changes color in a minute or two; at TL8, reaction time is instant. A test kit of 50 strips, covering a wide array of chemicals: $25, 0.5 lb. LC4.

Handheld Detector (TL8). This state-of-the-art handheld unit can sense an entire range of dangerous or illicit substances – typically chemical weapons, drugs, or explosives. Detection range is about 1'. $60,000, 6 lbs., 4×S/12 hrs. LC4.

Portable NBC Detector (TL8). This lunchbox-sized detector automatically sounds an alarm in the presence of any known NBC agent. It can be connected to other sensors to form a perimeter, or monitored remotely from a laptop. Most modern AFVs carry such a detector. $100,000, 15 lbs., M/14 hrs. LC4.

Hydrophones (TL6)

A hydrophone is a sensitive underwater microphone that can detect and track *moving* or *noisy* objects in the water. The British used hundreds of them as early as 1911, mostly for navigation; buoys and other navigational aids had bells affixed to the underside so that vessels could get a bearing even in bad weather. By the end of WWII, the Americans were airdropping "sonobuoys" in the Pacific. During the Cold War, the U.S. developed a network of deep-ocean hydrophones – the Sound Surveillance System (SOSUS) – capable of tracking Soviet nuclear submarines nearly anywhere in the world.

To detect a noisy underwater object, roll against Electronics Operation (Sonar). Most hydrophones give a bonus to this roll (see below). Look up the target's size, speed, and range *separately* on the *Size and Speed/Range Table* (p. B550), and apply bonuses for size and speed, but a penalty for range. Swift currents generate "noise"; find the current's speed on the table and assess a speed penalty.

Success reveals the target's location (direction and distance), vector (speed and direction of movement), rough size, and general class based on sounds (e.g., "whale" or "nuclear sub") – but not shape, color, etc. This information gives +8 to identify the target, +4 to shadow it, and +3 to hit it with an aimed attack. If using a hydrophone fix to direct an attack, the modifiers that applied to the detection roll also apply to the attack roll, but can never give a bonus to hit.

Hydrophones *automatically* detect sonar (pp. 45-46) and underwater communicators (p. 40) at twice those systems' range.

Large Hydrophone (TL6). A vehicle-based system – or at TL7-8, a deep-ocean sensor like those that make up SOSUS. +4 detection rolls. $1,000,000, 2,000 lbs., external power. LC3.

Medium Hydrophone (TL6). A typical swimmer-detection system. +2 detection rolls. $50,000, 200 lbs., external power. LC3.

Small Hydrophone (TL7). A compact device, like an air-dropped sonobuoy. $5,000, 15 lbs., M/4 hrs. LC2.

The detection bonus increases by +2 for each TL after introduction.

Search Hydrophone (TL6)

Simple hydrophones are used for underwater research, fishing, and perimeter surveillance. These *don't* provide the +3 targeting bonus. Typical TL7-8 trawlers carry small search hydrophones. Divide cost by 10. Raise LC to 4.

Radiation Detectors (TL6)

The most basic radiation detector is chemically treated film that darkens in the presence of radiation. During the Manhattan Project, U.S. Army personnel wore badges made from discarded photographic film. Later models have colored level indicators, and are often built into ID or security badges.

A Geiger counter is the radiation detector most *familiar* to the average person, however. It measures the type (alpha, beta, or gamma) and level of radioactivity. Readings can give a user with Electronics Operation (Scientific) a clue as to the radiation's source. For instance, atomic weapons contain uranium and plutonium, which are primarily alpha emitters.

A dosimeter is different from either. It tracks total exposure over a period of time and sounds an audible alarm if the dosage reaches dangerous levels. People working around radioactive materials are normally required to wear a dosimeter throughout their workday.

Geiger Counter (TL6). $800, 4 lbs., 4×S/4 hrs. LC4.

Radiation Badge (TL7). This ID badge has a color strip indicator that shows the total dosage to which it has been exposed. $5, neg. LC4.

Geiger Counter (TL8). Has a digital display. $400, 0.5 lb., XS/10 hrs. LC4.

Personal Dosimeter (TL8). Industrial or military versions are the size of a pager, but the electronics can be miniaturized to fit inside a wristwatch (p. 31). $120, 0.5 lb., 2×XS/yr. LC4.

Sound Detectors (TL6)

From the start of the 20th century, there were attempts to locate targets via their acoustic emissions. During WWI, sound detectors successfully triangulated firing enemy artillery this way. Sound-detection equipment is available after 1910 in any industrialized nation.

A sound detector gives +4 to Electronics Operation (Sensors) rolls made to analyze and identify a particular sound. It can also zero in on and magnify sounds from a particular distant point for eavesdropping; this requires an Aim maneuver. Sound detectors work only in air – not underwater (use hydrophones, see above, which are far more sensitive) or in vacuum.

Sound-Detection Gear (TL6). This sensitive array of horns can locate a sound source of 100 decibels (firing artillery piece, approaching aircraft, etc.) to within two yards at a distance of 10 miles. Apply +1 to skill per mile closer or 10 decibels louder, -1 per mile more distant or 10 decibels fainter. Ambient noise can give -1 to -10 (GM's decision). Multiple observation sites are necessary to triangulate a target, and each site needs its own set of equipment. Triangulation requires either successful observations at three sites or a success at one and a critical success at another. $10,000, 400 lbs., external power. LC3.

Directional Microphone (TL7). A mike that picks up sound in a narrow cone similar in shape to a shotgun blast. Headphones included. Amplifies a particular sound by 4× at TL7, 8× at TL8. $800, 3 lbs., 4×S/10 hrs. LC4.

Scientific Equipment

Scientific researchers use a lot of specialized, *expensive* gear. Mad-scientist PCs can improvise to save money, but there can be consequences beyond simple skill penalties. Thomas Edison's first "lab" was a loose collection of chemicals, batteries, and glassware in a freight car. An accidental fire ensured that the 15-year-old railroad employee was promptly evicted!

Portable Laboratories (TL5)

A portable lab provides the scientific equipment necessary to conduct research in the field, away from specialized analysis systems and major research facilities. It's dedicated to a particular skill – Archaeology, Biology, Chemistry, Farming, Forensics, Geology, Metallurgy, Paleontology, Pharmacy, or any other scientific skill. The included instruments fulfill that skill's equipment requirements when gathering and analyzing samples. If lab TL and skill TL don't match, apply *Tech-Level Modifiers* (p. B168).

> *Lucius Fox: I analyzed your blood . . . isolating the receptor compounds and the protein-based catalyst.*
>
> *Bruce Wayne: Am I meant to understand any of that?*
>
> *Lucius Fox: Not at all. I just wanted you to know how hard it was.*
>
> ***– Batman Begins***

For example, a TL6 suitcase chemistry lab is a portable chemistry workshop. It lets anyone with Chemistry/TL6 analyze complex compounds, exotic alloys, etc. It can also manufacture chemical compounds (such as explosives) in small quantities.

Labs don't get cheaper, lighter, or more effective as TL increases. They allow use of higher-TL skills and applications. At TL7-8, *all* labs require external power or a variety of batteries.

Suitcase Lab (TL5). A "mail-order chemistry lab" or equivalent. Takes *at least* 10 seconds to set up or pack. Counts as basic equipment for the skill. $3,000, 20 lbs. LC4.

Field Lab (TL5). Equipment similar to that found in a well-appointed high school or college lab. Takes *at least* a minute to set up or pack. Gives +1 (quality) to skill. $15,000, 200 lbs. LC4.

Mobile Lab (TL5). Enough equipment to fill a room. Takes *at least* 15 minutes to set up or pack. Gives +2 (quality) to skill. $75,000, 1 ton, external power. LC4.

Miscellaneous Scientific and Survey Devices (TL7)

Several items are useful not only for ordinary fieldwork but also for espionage, detective work, and other adventuring activities.

EM Field Meter (TL7). This device detects slight changes in electromagnetic (EM) fields. Scientists use it to test electronic equipment. Parapsychologists use it to detect the EM fields that purportedly accompany supernatural events. $500, 1 lb., S/10 hrs. LC4.

Fume Sponge (TL7). An absorbent tissue introduced into a target area to collect dust, smoke, chemical droplets, etc., for later analysis. To analyze the materials on the sponge, roll against Chemistry or Forensics. Success may confirm the presence of a top-secret weapons factory, invisible pollution, or even a particular person (from his chemical "fingerprint" of toiletries, hair particles, body odor, etc.). $50, 0.5 lb. LC4.

Metal Detector (TL7). This is a handheld detector about a yard long. The user wears the attached headphones and sweeps the ground in front of him as he walks. If he finds something metallic, the device will beep. A basic model – often used as a mine detector – can detect metal up to 20" underground, although 6" is more typical for small objects like coins and rings. Higher-quality equipment can detect large objects much deeper, and at TL8 has a screen that displays the general shape and composition of the find. Halve weight at TL8. $100, 12 lbs., 6×S/8 hrs. LC4.

Dart Transmitter (TL8). This is a radio beacon in a standard 11mm dart (p. 89). Use a radio direction finder (pp. 38-39) to track it. The internal battery lasts for 3 days. $200, neg. LC4.

Pocket Weather Station (TL8). This cell phone-sized device has a large display screen and a coin-sized wind turbine, and displays altitude, barometric pressure, wind speed, temperature, wind chill, relative humidity, and dew point. The internal rechargeable battery lasts for 15 hours of continuous monitoring or hundreds of "spot" readings. $300, 0.5 lb. LC4.

TDS Tester (TL8). A pen-sized gadget that can detect the total dissolved solids (TDS) level in water, indicating whether water is safe to drink. $20, neg., T/1,000 hrs. LC4.

Temperature Gun (TL8). A non-contact infrared sensor for reading the surface temperature of objects up to 12 yards away. Beyond its scientific and engineering uses, ghost hunters claim it can detect "cold spots" generated by some supernatural phenomena. $400, 0.5 lb., S/20 hrs. LC4.

Expedition Gear

In 1804, Lewis and Clark's Corps of Discovery set out to cross a continent. Along with them went two tons of equipment selected by Lewis and his patron, President Thomas Jefferson. Their list included 10 lbs. of fishhooks, a sextant, a chronometer, and four compasses. The group returned two and a half years and 8,000 miles later, having lost only one companion (to a ruptured appendix, an untreatable condition at the time).

A century later, Norwegian explorer Roald Amundsen spent two years in the Antarctic and was the first to reach the South Pole – beating Englishman Robert Scott by a mere 35 days. All of Amundsen's party returned safely; all of Scott's perished. The deciding factor, according to Amundsen, was planning and equipment.

Lights

The well-prepared man always has a means of making light; the paranoid man, several means. Below are many options. For general game effects, see *Visibility* (p. B394).

Candles (TL0)

Candles remain the main lighting technology through TL5. In the 1700s, the average family used 40 lbs. of candles a year. Lewis and Clark's expedition took along moulds and wick to make tallow candles as needed. During the American Civil War, the U.S. Army ration was 1.5 lbs. of candles per 100 men each day.

There are two major types of candles: tallow and wax. Tallow candles are made from rendered fat; they stink, produce more smoke, and sputter loudly as they burn. Wax candles produce no odor unless perfumed, and are nearly silent. A candle of either kind produces enough light to read by, or to illuminate a 2-yard radius.

Tallow Candles (TL0). These are issued in some military survival kits until the 1950s, because tallow can be eaten – treat 0.5 lb. as a meal. Burns 4 hrs. per ounce (1/16 lb.). Per ounce: $0.03. LC4.

Wax Candles (TL1). Made of beeswax, whale oil (spermaceti), or paraffin. All produce a clean, odorless flame. Burns 8 hrs. per ounce. Per ounce: $0.30. LC4.

Candle-Lantern (TL5). A candle-lantern allows still-air burning rates even in the wind. A typical model is the size of soda can and equipped with a shutter to conceal the light. $5, 0.5 lb. LC4.

Lanterns (TL5)

Oil-burning lanterns started to supplant candles as the standard light source during the American Civil War period. The trend continued until electricity finally reached the most remote backwaters of the U.S. in the 1930s.

At TL5, the most common fuels are whale oil (made from blubber), turpentine, and camphene (an alcohol-turpentine mixture). At TL6+, lanterns typically burn kerosene (p. 16) or lamp oil – *purified* kerosene that produces a clean-burning flame. The duration of a pint of fuel is given for each type of lantern, below.

Lanterns are much brighter than candles, but they aren't durable. They'll break if dropped on hard ground (roll vs. HT 6) and take 30-60 seconds to relight. They can burn in a wet environment such as a rainstorm, but are instantly extinguished if submerged.

Bull's-Eye Lantern (TL5). A signal lantern used by sailors, soldiers, police, and railroad conductors. It has a glass lens and a shutter. Photographers cover the lens with red silk or paper when working in the darkroom. A lantern of this type was recovered from the wreck of the *H.L. Hunley.* 10-yard beam. Pint/6 hrs. $25, 2 lbs. LC4.

Glass Lantern (TL5). Most lanterns were of ornamental glass, and were kept by the table for sewing or reading at night. Such a lantern is *fragile,* and will cause a 1-yard-radius fire if it breaks (see *Molotov Cocktail,* p. 191). Illuminates a 5-yard radius. Pint/10 hrs. $15, 2 lbs. LC4.

Carbide Lamp (TL6). Popular with spelunkers and miners since the 1890s, this consists of a belt- or head-mounted light. The user puts carbide and a small amount of water in the generator, which produces acetylene gas. It burns for 5 hours on 0.25 lb. of carbide ($0.30 per refill). Illuminates a 5-yard radius or projects a 10-yard beam. $50, 3 lbs. LC4.

Kerosene Lantern (TL6). A covered "hurricane" lantern that can't be blown out. It's also self-dousing, so it has little chance of causing a fire if dropped. Kerosene lanterns were first produced in the 1860s and are still manufactured today. At TL8, dual-fuel versions (×2 cost) burn both gasoline and kerosene. Illuminates a 5-yard radius. Pint/12 hrs. $25, 4 lbs. LC4.

Electric Lanterns (TL6)

Electric lanterns appear at TL6 but can't match the duration of fuel-burning ones until TL8. On the other hand, they can't be snuffed by wind or doused by water, don't require dangerous fuel, and are safe in volatile atmospheres. Most importantly, they can be turned on and off quickly.

Electric Lantern, Small (TL6). 3-yard radius. $5, 4 lbs., M/4 hrs. LC4.

Electric Lantern, Small (TL7). 3-yard radius. $5, 2 lbs., 3×S/4 hrs. LC4.

Electric Lantern, Large (TL8). 5-yard radius. Double cost for dive-certified models that can operate to a depth of 600'. $30, 3 lbs., 4×S/20 hrs. LC4.

Flashlights (TL6)

Eveready's "electric hand torch" debuted in 1898. The body was a paper tube. The flashlight's small size and reliability made it a common item in almost every toolbox or automobile glove compartment by the 1920s.

A regular flashlight can be converted to an IR illuminator (p. 47) by adding a snap-on filter. Its bulb assembly can be changed to produce UV light, making it useful for forensic work, tracking alien blood, etc. Either modification costs $25.

It takes a Ready maneuver to turn a flashlight off or on, adjust the beam, switch settings, etc.

Flashlight (TL6). A basic flashlight. Batteries last 10× as long at TL8. 10-yard beam. $20, 1 lb., 2×S/5 hrs. LC4.

Micro-Flashlight (TL6). A tiny penlight or key-ring light. Batteries last 10× as long at TL8. 1-yard beam. $5, neg., T/2 hrs. LC4.

Mini-Flashlight (TL6). A pocket-sized light. At TL8, the batteries last 10× as long and this type of light is often worn on the *head,* which allows hands-free use: the light points wherever the user is looking. 5-yard beam. $10, 0.25 lb., 2×XS/1 hr. LC4.

Survival Flashlight (TL6). Gives 3 minutes of light after 30 seconds of winding or shaking. At TL8, double duration (to 6 minutes) but halve weight. 1-yard beam. $20, 1 lb. LC4.

Floodlight (TL7). A large, portable spotlight. Double cost for dive models that can operate to a depth of 600'. If aiming the light in combat, treat as a searchlight (p. 228). 200-yard beam. $100, 3 lbs., M/4 hrs. LC4.

Smart Flashlight (TL8). A flashlight with a super-bright light and a dimmer switch. It can switch between white, red, green, and infrared-only (as an infrared illuminator, p. 47). 50-yard beam for 2 hour or a 5-yard beam for 40 hours. $300, 0.5 lb., 2×XS. LC4.

Tritium Illuminator (TL8). A light the size of ballpoint-pen cap, bright enough to let one read a map or see a keyhole. The radioactive tritium gas inside stimulates a phosphor, making it self-powered for 10 years. It can be shuttered by turning a knob, but it can't be shut off. $10, 0.1 lb. LC4.

Chemlight (TL7)

In the mid-1970s, the U.S. military developed a chemical-luminescent light that didn't produce heat or require batteries. The "chemlight" or "glowstick" was born. Simply snap the plastic rod and shake for three seconds. Most models provide 12 hours of light and come in a variety of colors – including a version that acts as an infrared illuminator (p. 47). Illuminates a 2-yard radius. $2, 0.1 lb. LC4.

Tactical Lights (TL7)

Tactical lights are powerful, waterproof flashlights used by soldiers and police. They come in to two sizes: small and large. The small version can be mounted on *any* firearm, and illuminates an area immediately in front of the muzzle. Held in the fist, it can be used to deliver a devastating punch; treat as brass knuckles (p. B271). The large model is more powerful, and can be mounted on a rifle, shotgun, or SMG. It counts as a baton (p. B273) in melee combat.

A tactical light is bright enough to momentarily stun the opposition in potential surprise situations (p. B393). As well, those who look directly into the light must make a HT-4 roll or be temporarily blinded. Blindness lasts for 10 seconds times the margin of failure.

A tactical light is the flashlight of choice for those who need the most powerful, dependable hardware available. Treat it as *rugged* and *expensive* to begin with (see *Integrating and Modifying Equipment,* pp. 9-10) – don't add those options again.

Large Tactical Light (TL7). 100-yard beam. $200, 2 lbs., 4×S/1 hr. LC4.

Small Tactical Light (TL7). 25-yard beam. $100, 1 lb., 2×S/2 hrs. LC4.

Large Tactical Light (TL8). 100-yard beam. $200, 0.5 lb., 4×XS/2 hrs. LC4.

Small Tactical Light (TL8). 25-yard beam. $100, 0.25 lb., 2×XS/2 hrs. LC4.

Navigation Instruments

At TL5, the basic tools of navigation include the compass, the sextant, and the marine chronometer. At TL8, GPS makes navigation far easier and more precise.

Compass (TL5)

A compass exploits the fact that a magnetized needle orients itself toward the Earth's poles. This doesn't reveal *true* north, but magnetic north. (On other planets, the two might be far apart, or there might not even *be* a magnetic field!) A compass gives +1 to Navigation (Air, Land, or Sea). Styles vary, from pocket watch-style compasses that open to reveal a sundial (popular with Rogers' Rangers during the French and Indian War) to models worn on the wrist, stored in the handle of a survival knife (p. 197), etc. $25, neg. LC4.

Maps (TL5)

The first topographic map of an entire country was completed in France in 1793 – the work of four generations of cartographers. Louis and Clark mapped parts of the Louisiana Purchase, and the Union army produced nearly 50,000 maps a year during the American Civil War. American infantry divisions during WWII printed maps by the ton, which were updated constantly from aerial reconnaissance.

Successful use of the Cartography skill (p. B183) allows a mapmaker to create a map accurate enough for navigation – that is, to fix a location or plot a course. However, collecting the information to place on a map can involve a variety of skills: Observation, Electronics Operation (Sensors), Interrogation, Photography, etc. For more on mapping, see *Mapping Overland Journeys* (p. B491).

An accurate map is considered basic equipment for the Forward Observer and Navigation skills. Inaccurate maps give from -1 to -5 for improvised equipment. Having no map at all gives -10!

Costs range from free to exorbitant; $15 for a national road atlas and $30 for a detailed topographic map of a region are typical. At TL8, topographic maps for an entire continent are $100 and fit on one CD. Weight is 0.1 lb.

Marine Chronometers (TL5)

An invention of the 1760s, the marine chronometer is a clock accurate to within seconds over the course of several months. It's kept set to the time at a location of known longitude – historically, Greenwich, England. The constant rotational speed of the Earth lets a navigator use the difference between the set time and local time to fix his longitude. Many ships carry three chronometers as a safety measure.

A marine chronometer gives +1 to Navigation (Sea) by itself. When used with navigating instruments (below), the combined bonus is +3.

Pocket Chronometer (TL5). A chronometer the size of an oversized pocket watch. $500, 0.5 lb. LC4.

Ship's Chronometer (TL5). An extremely accurate clock, mounted in gimbals so as not to be affected by the motion of a ship. $1,000, 15 lbs. LC4.

Navigating Instruments (TL5)

These include chart books, compass, sextant (or its precursors, cross-staff and astrolabe), dividers, lead line, log (to toss overboard to figure speed), and sand-glass (to measure time). Collectively, this gear gives +2 to Navigation (Sea) at TL5, +3 at TL6+. $3,000, 30 lbs. LC4.

Surveying Instruments (TL5)

Surveyors are in constant demand for road, bridge, and fortress construction. A typical surveying crew consists of three or four men. Starting from a known point, they can locate any point within five miles to an accuracy of one inch. This requires a day's work.

The necessary tools include compass, transit, chains, flags, plotting boards, and drawing instruments. These provide +2 to Mathematics (Surveying) or Navigation (Land). $1,000, 300 lbs. LC4.

Global Positioning System Receiver (TL8)

In 1978, the U.S. launched the first Global Positioning System (GPS) satellite, fitted with extremely precise time- and station-keeping electronics. A receiver on the ground can locate itself via the signals broadcast by a "constellation" of several such satellites within line of sight, thereby providing accurate coordinates in three dimensions (latitude, longitude, and altitude). The unit also displays the exact time – the satellites' internal clocks are synchronized to within nanoseconds!

A GPS receiver gives +3 to Navigation (Air, Land, or Sea) while it's within line of sight of a satellite constellation. Maximum accuracy is to within a few feet. Early units were the size of a paperback book, but the smallest ones today fit inside a wristwatch or other tiny electronic device (add $50). A typical handheld model, the size of pack of cigarettes: $100, 0.25 lb., 2×S/40 hrs. LC4.

Load-Bearing Gear

When setting off on an adventure, all the supplies and high-tech gadgets in the world won't do you much good if you can't carry or ship them!

Canteens (TL5)

A canteen (from the Italian *cantina,* meaning "wine cellar") is a water flask – a desert explorer's most important kit. All of these containers but the water pack slosh loudly if not filled to the brim, negating the Stealth benefits of load-bearing equipment (p. 54). The weights given assume a container *full* of water (2 lbs./quart). Note that water in a canteen will soon freeze solid in winter.

Canteen (TL5). A basic, 1-quart canteen. At TL5, it's made of wood, copper, or tin. At TL6, it's aluminum or steel, often with a small cup, and easily wrecked if handled roughly (stepped on, dropped from a height, etc.). At TL7+, plastic models are much less susceptible to damage. These have a receptacle in the cap that mates with a tube on a gas mask (p. 72), making it possible to drink from them in NBC conditions. $10, 3 lbs. LC4.

Charcoal-Filtered Canteen (TL5). During the American Civil War, sutlers peddled what looked like an ordinary, quart-sized tin canteen. However, inside was a charcoal filter. Water was poured in one spout, passed through the filter in the middle, and poured out from the other side, ready to drink. This gives +2 to HT rolls when drinking bacteria-ridden water (see *Contagion,* p. B443). $25, 3 lbs. LC4.

Water Bottle (TL8). A 1-quart drinking bottle made from shatterproof plastic, popular with athletes and outdoorsy types. $10, 2.5 lbs. LC4.

Water Pack (TL8). A 2-quart flexible bladder worn on the back, with a drinking tube that extends over the shoulder. The hose is bite-activated, so that the user can sip from it. Most backpacks can accommodate a water pack. $25, 5 lbs. LC4.

Containers (TL5)

Whether planning a year-long expedition or a weekend trip, a traveler should pack his equipment carefully if he expects to find it in one piece at his destination. The shipping method determines the skill required: Packing (p. B212) if animals are involved, Freight Handling (p. B197) for vehicles of all types. A successful roll ensures that the cargo survives intact. The GM may assess penalties if the cargo is nonstandard (how *do* you ship an elephant?) or fragile, or if the route or shipping method is particularly arduous. A camera is far more likely to survive a 1,000-mile journey on a jet plane than on a buckboard! Likewise, the GM may grant bonuses for extra precautions, including high-quality containers (p. B345).

Steamer Trunk (TL5). An iron-banded travel trunk with lock. Holds 400 lbs. or 5 cubic feet. DR 2. $200, 40 lbs. LC4.

Wooden Barrel, Large (TL5). Holds 30 gallons. DR 1. $200, 50 lbs. LC4.

Wooden Barrel, Small (TL5). Holds 5 gallons. DR 1. $65, 20 lbs. LC4.

Wooden Crate (TL5). Holds 300 lbs. or 5 cubic feet. DR 1. $25, 20 lbs. LC4.

55-Gallon Drum (TL6). DR 3. $50, 55 lbs. LC4.

5-Gallon Can (TL7). A common fuel or water container. DR 3. $15, 10 lbs. LC4.

Cargo Containers (TL7)

At TL7-8, shippers use a cargo container – sometimes called a "container express," or "conex" – to protect cargo. A conex is a sheet-metal box that provides a safe means of moving cargo via multi-modal transportation (ship, rail, and truck). Conexes can be stacked atop one another on ships and trains, handled by cranes, or attached to wheels and towed like trailers.

Conexes can be found by the thousands at major ports, train stations, and trucking hubs. The most common sizes are 20' and 40'. Both come in "dry" and refrigerated versions. They can be converted to offices, storage sheds, guard shacks, munitions-storage facilities, etc., with minimal effort.

20' Conex (TL7). 20'×8'×8'6". Gross weight is 26.5 tons. DR 4. $1,500, 2.5 tons (empty). LC4.

40' Conex (TL7). 40'×8'×8'6". Gross weight is 33.6 tons. DR 4. $1,500, 4 tons (empty). LC4.

Load-Bearing Equipment (TL5)

Until late TL5, load-bearing equipment (LBE) – the belts, bandoleers, etc., that soldiers wear to carry kit – is made of leather. It's heavy, shiny, and squeaky. It tends to dry rot quickly, and requires a *lot* of cleaning and polishing to outlast a single military campaign.

In 1877, U.S. Army Capt. Anson Mills drew on his experiences as a cavalry officer in the Indian Wars to develop the first cartridge belt made of fabric webbing. In his words, it was "lighter, more flexible, did not require oiling, and was less likely to break in the process of wetting and drying." Mills' webbing proved popular in America and abroad. He established the Mills Woven Cartridge Belt Company in 1880 and retired a millionaire.

Proper LBE doesn't merely help adventurers lug lots of gear – it lets them carry it *efficiently*. It comes in the standard quality grades (p. B345). The user must make a Soldier or IQ-based Hiking roll to set up and maintain LBE. Success lets the wearer add the quality bonus of his LBE to *several* die rolls, as described below. Failure means the LBE counts as improvised at best, giving -2 or worse instead.

First, the GM may require a DX roll to reach gear if it or its user is in an awkward position; e.g., a soldier lying atop his grenades or magazines, or trying to grab a grenade while hanging one-handed from a helicopter skid. Readying in close combat (p. B391) also calls for a DX roll. The quality bonus of LBE benefits these rolls.

As well, retrieving an article crammed into a pack, cargo pocket, etc., is a "long action" that takes 1d or 2d seconds (p. B383). Fast-Draw isn't allowed. Grabbing an item from properly set-up LBE requires only a *single* Ready maneuver – and a roll against a suitable Fast-Draw specialty makes this a free action. Add the quality bonus of LBE to such Fast-Draw rolls. Most people secure the flaps on LBE pouches (and packs) so things won't fall out; opening a flap adds an extra Ready maneuver.

Finally, quality LBE benefits Stealth. With no LBE or only TL5 gear, Stealth suffers a penalty equal to encumbrance level; see p. B222. At TL6+, reduce this penalty by the quality bonus of LBE.

Cartridge Bandoleer (TL5). Bandoleers are a simple way to carry ammunition ready to use. They're worn across the chest. A typical bandoleer holds 50 rifle, shotgun, or pistol rounds in loops. Takes one second (a Ready maneuver) to don or remove. $15, 1 lb. LC4.

Cross-Belts and Cartridge Pouch (TL5). A typical rig for a soldier from the 1700s through 1870, with leather belts crossed like suspenders and attached to a waist belt. A leather pouch – often metal-lined or with a wooden block inside – holds 20-40 paper cartridges. Takes five seconds to don, two seconds to remove. $50, 5 lbs. LC4.

Web Gear (TL6). A canvas belt and suspenders, with pouches for ammunition and equipment. A typical setup is two ammo pouches in the front; canteen, entrenching tool, or other gear on each hip; and a "butt pack" on the back. Fully loaded, it may support 20-30 lbs. Takes five seconds to don, two seconds to remove. $20, 3 lbs. LC4.

Load-Bearing Vest (TL7). The modern assault vest dates to the Vietnam War, and becomes popular in the late 1980s among SWAT teams and the like. An LBV is easier to take on and off – and the gear is carried up on the torso, which protects the contents when wading in water. It's also less cumbersome in tight spots, which is important to tankers and aircrew. It's designed to hold 20-30 lbs. of gear. Modern body armor often features integral pouches and attachment points, making it equivalent to a LBV. Takes two seconds to don or remove. $30, 2 lbs. LC4.

Packs and Bags (TL5)

Explorers and soldiers alike prize a well-constructed backpack; for anyone who lives out of his pack, it pays to get the best tool for the job. British regulars during the Revolutionary War carried shaggy goatskin knapsacks – or flimsy canvas or linen bags, painted for extra protection. At TL5-6, most packs are leather or canvas like this, and incapable of keeping out the rain. At TL7, packs are made of water- and mildew-proof synthetics. At TL8, advanced ergonomic features – including S-shaped shoulder straps, internal frames, hip pads, and wide, padded waist belts – make it easier than ever to pack a heavy load comfortably.

Make a Soldier or IQ-based Hiking roll to fit a pack. Failure means a poorly fitted pack that will cause moderate pain (see *Afflictions,* p. B428) after a day of hiking. The -2 for pain *definitely* applies to the Hiking skill! Quality equipment grants a Hiking bonus but is hard to find before TL7 – it's the purview of custom outfitters, and generally made-to-order. Expedition packs can cost many hundred dollars.

At TL8, *halve* all pack weights.

Backpack, Small (TL5). A small backpack or haversack. From the French and Indian War until 1900, soldiers typically carried packs of this size. Holds 50 lbs. Double cost at TL8. $60, 3 lbs. LC4.

Travel Bag (TL5). A leather duffle or similar. Holds 100 lbs. $60, 10 lbs. LC4.

Waist Pack (TL5). A small haversack, large purse, or "butt pack." Holds 10 lbs. $10, 1 lb. LC4.

Backpack, Large (TL6). A heavy pack with frame. Dubbed a "mountaineering pack" by some, it's typical of most modern military expedition packs. Holds 100 lbs. Double cost at TL8. $100, 10 lbs. LC4.

Climbing and Mountaineering Gear

Perhaps the most famous climb in modern memory is George Mallory's third attempt at Mt. Everest in 1924. Mallory and assistant Sandy Irvine were last seen less than 300 yards from the summit – "moving expeditiously" toward the top, as one observer famously said – before they vanished. New Zealander Sir Edmund Hillary and his Sherpa, Tenzing Norgay, succeeded in 1953. Mallory's remains were discovered in 1999, but the mystery of whether he and Irvine beat Hillary to the top remains.

Climbing Equipment (TL5)

Climbing is a complicated and potentially dangerous undertaking. Ropes fray, bolts pull loose, and high winds can toss a climber off a precipice without warning. Sometimes, though, tackling a crag (or an office tower!) is the only way to get the job done.

The well-equipped climber wears a harness connected to a safety line that is tied off to fasteners. This will stop his fall, should one occur. The results of a fall depend largely on the terrain and the precautions taken. In general, the maximum distance the climber can fall is *twice* the distance between the last fastener and his current position. Safety-conscious climbers tie off every few feet, guaranteeing a short fall with little chance of injury. Braver souls – and those in a hurry – tie off less often.

The easiest way to come down is to rappel. This requires rope, a harness, and a carabiner or descender. Normally, the climber faces the wall (mountain, building, etc.), looks over his shoulder as he slides down the rope, and pushes off the wall with his feet. A more daring method is to stand directly out from the wall, facing downward, and *run* toward the bottom. SWAT men and soldiers sometimes rappel this way so that they can *shoot* on the way down! This counts as bad footing and a minor distraction, for a net -4 to hit (see p. B548) – but the Sure-Footed perk (p. 250) can partially mitigate the penalty.

Climbing is possible without special gear, but speed is reduced and there's no limit to how far you can fall. For climbing and rappelling speeds, see *Climbing* (p. B349). For the consequences of a failed climb, see *Falling* (p. B431).

Fasteners (TL5). Also called "protection," these devices hold a rope fast in case the climber slips. Models differ by function: some are hammered into rock, others are placed in cracks or crevices, and still others are screwed into solid ice. Be they soft iron spikes ($1, 0.5 lb. apiece), steel pitons ($5, 2.5 lbs. for 10), or ice screws ($5, 0.25 lb. apiece), all penetrate the climbing surface. LC4.

Harness (TL5). A climbing and rappelling harness with several snap-links or carabiners. $75, 3 lbs. LC4.

Ascender (TL6). Uses a cam or a ratchet to ascend a free-hanging rope. Cancels the -2 for climbing *up* a rope (p. B349). $50, 1 lb. LC4.

Descender (TL6). A D-shaped device for rappelling down a rope. Cancels the -1 for climbing *down* a rope (p. B349), and allows the climber to stop and hang in midair with both hands free. $50, 0.75 lb. LC4.

Hand Drill (TL7). A one-man rock drill (p. 26). It requires one hand to hold the drill bit and another to hammer. It takes 30 minutes to drill a 3" bolt hole in normal rock. Bolts ($5, 0.1 lb. apiece) are hammered into the hole, and expand to grip the sides firmly. $50, 0.5 lb. LC4.

Climbing Kit (TL8). Harness, ascender, descender, an assortment of fasteners, and 100 yards of 3/8" rope. A high-quality *kit* provides a bonus to Climbing skill. $400, 26 lbs. LC4.

Mini-Rappel Kit (TL8). A complete rappelling system: harness, carabiner, descender, and 33 yards of 1/4" rope. The whole kit fits in a small belt pouch. $150, 3 lbs. LC4.

Humping, Tramping, and Yomping

Whatever you call it, marching cross-country under full kit is exhausting. The hiking rules in the ***Basic Set*** are intentionally simplistic – they assume fine weather, ideal terrain, and a grueling 16-hour day spent doing nothing but putting one foot in front of the other. Hikers often march for less than a full day, which can make it useful to know *hourly* movement rates.

Assume that speed in miles per hour equals Move/2. Adjust the pace as usual for terrain, weather, and roads; see p. B351. Note the FP costs for an hour of hiking given on p. B426 – good FP scores and the Fit advantage (p. B55) give a significant edge here! Extra effort works as usual (see p. B357). Each foraging attempt (p. B427) takes an hour, during which no progress is made.

Grappling Hook (TL5)

Getting a grapnel to the target requires a DX-3 or Throwing roll. Maximum throwing distance is ST×2 yards. Load limit is 300 lbs. at TL5, doubled at TL7. When a grapnel lands on stone, concrete, or similar materials, it can ring loudly – make an unmodified Hearing roll at 1 yard. A padded grapnel (+1 lb.) gives -2 to Hearing. At TL8, double cost buys a non-sparking, nonmagnetic version. $20, 2 lbs. LC4.

Ice and Snow Gear (TL5)

If climbing is challenging and dangerous, then tackling a mountain or crossing a glacier can be downright *deadly.* There are over 120 corpses on Mt. Everest, with new ones added each year. Dangers include hypothermia, frostbite, avalanche, collapsing crevasses, and altitude sickness. Well-equipped modern climbers use the equipment below, plus air masks (pp. 72-73) and air tanks (p. 74).

Crampons (TL5). These are heavy foot spikes attached to an explorer's boots. They "grab" the ice like football cleats, granting Terrain Adaptation (Ice) (p. B93) and giving +1 to Climbing on ice. Crampons can be worn with boots, shoes, or snowshoes. The wicked spikes give +2 to kicking damage, but are *noisy* when worn on tile floors, concrete, bare rock, and the like: -2 to Stealth. $100, 4 lbs. LC4.

Ice Axe (TL5). This is a one-handed tool used by climbers and explorers. The head has a hooked and serrated "pick" on one face and an adze on the other. It can be used stop a fall, or to chop handholds or steps out of ice. The butt has a sharp point and the top of the head is smooth, allowing the climber to use it as a walking stick, with the point digging into the ice for leverage. Treat as a pick (p. B271) in combat. $100, 2 lbs. LC4.

Skis (TL5). Skiers treat snow as "good" terrain when moving cross-country (see *Hiking,* p. B351), and retain their normal Move on level terrain. Movement uphill is halved unless using ski climbers ($15, 0.5 lb.), which give normal Move. Going downhill, tremendous speeds can be reached – Olympic skiers on prepared slopes have been clocked at 50 mph, and ski jumpers at 90 mph. Early skis are wooden, bound to the feet with leather straps. At TL8, skis are mostly laminated composite: halve weight. $175, 10 lbs. LC4.

Snowshoes (TL5). Snowshoes attach to boots with bindings of leather, cloth, or, at TL7-8, cold-resistant plastic. Their large surface area reduces the depth to which a hiker will sink into snow; treat all snow as "ankle-deep," regardless of its actual depth (see *Hiking,* p. B351). The snowshoes' bulk gives -1 to Move, however. For long-distance movement, use the Hiking skill; those unfamiliar with snowshoes are at -2 (see *Familiarity,* p. B169). At TL8, high-performance snowshoes weigh half as much and are faster: they prevent sprinting but don't otherwise reduce Move. $100, 5 lbs. LC4.

Avalanche Transceiver (TL8). This is a personal rescue beacon (p. 58) with a 20- to 50-yard range when buried under snow.

Rope (TL5)

The load limits given below are *working* loads, set at 10% of the rope's tensile strength. Any rope that's likely to be given a sudden jerk, or that's under constant tension, abrasion, or similar stressful circumstances, shouldn't be loaded past this level. Exceeding this limit invites problems and shortens the rope's life.

Cord (TL5). Hemp. Supports 50 lbs. Per 10 yards: $5, 1.5 lbs. LC4.

Rope, 1/2" (TL5). Hemp. Supports 300 lbs. Per 10 yards: $30, 3.6 lbs. LC4.

Rope, 2 1/2" (TL5). Hemp. Supports 1 ton. Per 10 yards: $450, 55 lbs. LC4.

Rope, 1/2" (TL6). Manila. Supports 350 lbs. Per 10 yards: $10, 2.2 lbs. LC4.

Rope, 1 1/2" (TL6). Manila. Supports 1 ton. Per 10 yards: $75, 18 lbs. LC4.

Cord (TL7) Synthetic. Seven inner lines – useful for fishing, suturing, or sewing – with a nylon covering. Supports 55 lbs. Per 100 yards: $15, 1 lb. LC4.

Rope, 1/4" (TL8). Synthetic. Supports 500 lbs. Per 10 yards: $30, 0.6 lb. LC4.

Rope, 3/8" (TL8). Synthetic. Supports 650 lbs. Per 10 yards: $25, 1.6 lbs. LC4.

Rope, 1/2" (TL8). Synthetic. Supports 2 tons. Per 10 yards: $90, 2 lbs. LC4.

Suction Cups (TL7)

In 1981, Dan Goodwin used three high-powered vacuum cups to climb the Sears Tower in six hours. High-strength suction cups can hold up 200 lbs. and cancel the -3 for climbing a modern building (p. B349). Each: $80, 3 lbs. LC4.

Personal Lifting Device (TL8)

This is a portable, one-man climbing hoist. It clips onto a climber's harness. At the touch of a button, it can ascend or descend a rope at 3 yards per second. A fuel cartridge ($100, 2 lbs.) powers an ascent of 200 yards. Lifting capacity is 300 lbs. $8,000, 7 lbs. LC3.

Survival and Camping Gear

When the best-laid plans fall apart, proper survival kit can mean the difference between a bad day and your *last* day. The same gear can make a weekend camping trip a wonderful natural experience.

Shelters (TL1)

Whether retreating from an arctic wind or hiding from the blistering sun, man's thin skin requires shelter. Each item below notes a modifier to HT and HT-based Survival rolls to avoid FP loss in freezing weather (p. B430); having *no* equipment gives -5. Quality bonuses are cumulative with these modifiers. As well, appropriate sleeping gear improves sleep quality, reducing the likelihood of FP loss and consequent penalties to DX, IQ, and self-control rolls (see *Missed Sleep,* p. B426).

Blanket (TL1). The most likely sleeping gear up to World War I is a simple woolen blanket (or *several* blankets, in extreme cold). During the American Civil War, soldiers on both sides carried a blanket roll – with a rubberized gum blanket on the outside (a tarp, below), if they were lucky. Survival modifier: -2. $20, 4 lbs. LC4.

Sleeping Bag (TL5). In the 1850s, this means a fleece-lined rubberized blanket. Modern versions are made of waterproof yet breathable materials. Divide weight by 2 at TL6-7, by 4 at TL8. Survival modifier: 0 at TL5-7, +1 at TL8. $100, 8 lbs. LC4.

Tarp (TL5). A heavy canvas or rubberized ground sheet – also called a "gum blanket" or a "ground fly." Modern versions are made of waterproof polyurethane. Ultralight backpackers use one for a tent. Halve weight at TL8. Survival modifier: +1. $20, 3 lbs. LC4.

Tent, Shelter Half (TL5). The standard U.S. Army tent from the Civil War through the 1980s, this is a small "pup" tent – so called because it's barely big enough for a dog! It

consists of two separate sheets of treated canvas, the "shelter halves." Weight includes poles and rope, which are split between two soldiers. Survival modifier: +1. $75, 10 lbs. LC4.

Tent, Wall (TL5). A common tent for an officer or a trapper – something that Washington, Wellington, or Grant might have used for a field headquarters. It's big enough to sleep six men. Survival modifier: +1. $350, 80 lbs. LC4.

Sleeping Bag, Heavy (TL6). A canvas-covered bag lined with sheepskin, which the 1902 Sears and Roebuck catalog called "the best bed ever invented for outdoor sleeping." Modern waterproof versions use synthetics and are *much* lighter: divide weight by 4 and multiply cost by 5 at TL8. Survival modifier: +3. $100, 15 lbs. LC4.

Blanket, Emergency (TL7). A fragile, metallized "space blanket" that reflects heat back toward the sleeper while repelling rain and wind. Survival modifier: -1. $5, 0.25 lb. LC4.

Tent, Dome (TL8). A modern, waterproof, expedition-grade tent for four men. It can withstand wind speeds beyond 50 mph. It takes about a minute to set up. A two-man version is half cost and 1/3 weight. Survival modifier: +2. $150, 12 lbs. LC4.

Tent, Personal (TL8). A bivouac ("bivy") tent just large enough for one person. It's water- and windproof, and sets up in about a minute. Survival modifier: +1. $100, 1 lb. LC4.

Cooking Gear (TL5)

When cooking in the wild, use the Survival skill to prepare an *edible* meal, the Cooking skill to produce more sumptuous cuisine.

Field Kitchen (TL5). A kitchen for 20 men, including serving and preparation utensils, stowed in a wooden box. $600, 80 lbs. LC4.

Hobo Knife (TL5). A pocket-sized jackknife with knife, fork, and spoon. When unfolded, it splits into two separate sections that can be used individually: a knife and a fork/spoon. A favorite of Union troops and Boy Scouts. $5, 0.25 lb. LC4.

Camp Stove (TL6). A portable cook stove suitable for an individual or a small group. It's often called a "primus" in honor of the popular Primus brand of stoves, first sold in 1892; explorers and adventurers have used similar stoves ever since. Most can boil a quart of water in 4 minutes or less. The original stoves generally used gasoline or kerosene, burning a 1-pint tank dry in two hours. Many makers switched to propane at TL7 (a 1-lb. cylinder lasts for about an hour and costs $5). The newest TL8 stoves have piezoelectric ignition and titanium bodies (×3 cost, ×1/3 weight). $40, 1 lb. LC4.

Sea Kettle (TL6). A 2-quart "chimney kettle" or "jacket boiler." Heat from a fire built in the base of kettle escapes out the chimney, heating up water stored in the jacket. This very efficiently brings the water to a boil; only a handful of twigs or a sheet or two of newspaper is necessary to boil 2 quarts of water in a couple of minutes. A rack fits over the mouth of the chimney for cooking a small meal. $75, 2 lbs. LC4.

Cooler (TL7). Coleman sold their first cooler in 1954. This example is capable of holding 16 cubic feet. It uses 25 lbs. of ice in three days in temperate conditions. At TL8, it uses external power to control the temperature thermoelectrically, from 40°F to 120°F. $150, 25 lbs. LC4.

Fuel Tablets (TL7). Many armies issued flammable fuel tablets during WWII; soldiers burned them to prepare a cup of coffee, tea, or soup. Each waterproof tablet burns for 15 minutes and can boil a quart of water in 5 minutes. A pack of 30: $10, 1 lb. LC4.

Group Mess Kit (TL7). A lightweight kit for four, with frying pan, bowl, and pot. At TL8, a titanium version is ×4 cost but ×1/3 weight. $30, 5 lbs. LC4.

Personal Mess Kit (TL7). A small cooking kit for one: small cook pot, can opener, fork, knife, cup, and spoon. At TL8, a titanium version is ×3 cost, but weight is a mere 0.3 lb. $15, 1 lb. LC4.

Solar Stove (TL7). In clear conditions, a solar stove can cook a meal in about the same amount of time as a fire. This commercial model includes an airtight cooking box, a temperature gauge, and a polished mirror to focus sunlight on the food. $250, 20 lbs., LC4.

Alcohol Pocket Stove (TL8). A tiny stove favored by backpackers, it can be made with a pocketknife and a couple of discarded soda cans in about 15 minutes. It can boil a quart of water in less than 10 minutes using an ounce of alcohol. A store-bought model is $20, neg. LC4.

Meal Heaters (TL8). Just add water and place a military ration (p. 35) inside the pouch. The flameless chemical reaction reaches nearly 180°F, and cooks the meal in minutes. Per dozen: $5, 1 lb. LC4.

Fire Starters (TL5)

Building a fire with natural materials requires a DX-based Survival roll. Most of the items below give +5 to +10 to this task. Thus, the GM should only require a roll in extraordinary circumstances – wet weather, high winds, etc.

Flint and Steel (TL5). Flint and steel can make a fire in less than 30 seconds in ideal conditions. Specially prepared "char-cloth," made by cooking scraps of cloth inside a tin, will catch a spark even in windy conditions. $5, neg. LC4.

Magnifying Glass (TL5). A small lens can easily start a fire on a sunny day. Such "burning glasses" were common fire-starting tools during the Napoleonic period. $10, neg. LC4.

Matches (TL5). The first successful strike-anywhere friction matches – called "lucifers" – became available around 1830. Paper matchbooks are a TL6 invention, from the 1890s. Varnished, waterproof matches that will light even when wet are also TL6. A box of 50 matches is $0.25, neg. LC4.

Musket (TL5). With a black-powder firearm, fire is always as close at hand – just fire a blank charge into a pile of tinder. If the gun is loaded and/or the sound would draw unwanted attention, stick a twig in the touchhole, put char-cloth and tinder in the flashpan, and catch a spark from the flint.

Cigarette Lighter (TL6). The famous Zippo was invented in 1932, but it was based on earlier designs, including WWI trench lighters. A lighter is good for several hundred lights and has a continuous burn time of about 20-30 minutes. At TL8, triple cost buys a windproof, waterproof model. $10, neg. LC4.

Fire-Starter Paste (TL6). A highly flammable substance used for lighting wet kindling in arctic conditions. A tube is enough for 20 fires. $5, 0.25 lb. LC4.

Solar Reflector (TL7). A pocket-sized parabolic reflector, which when aimed at the sun on a clear day will cause tinder to catch fire. An hour's work polishing the bottom of a soda can with a mild abrasive (toothpaste or chocolate works fine) will create a perfectly functional solar reflector. A commercial stainless-steel version is $10, neg. LC4.

Fishing and Trapping Kit (TL5)

A fisherman or trapper can make up to five Fishing or Survival rolls per day for food; see *Foraging* (p. B427).

Fishing Kit (TL5). A few hooks and sinkers, and a length of fishing line. Basic equipment for Fishing, and often found in survival kits (pp. 58-59). $5, neg. LC4.

Traps (TL5). Spring-powered "bear trap" devices, staked to the ground with a chain, give +1 (quality) to Survival. They have a rated ST, and inflict thr+2 crushing damage for that ST. Victims roll against this ST during attempts to break free (p. B371). The two most common sizes are the beaver trap (ST 8, $20, 2.5 lbs.) and a monster-sized version for large predators (ST 15, $75, 35 lbs.). LC3.

Fishing Outfit (TL6). A pole with reel, plus a toolbox with an assortment of jigs and lures. Gives +2 (quality) to Fishing. $200, 10 lbs. LC4.

Snare (TL6). A steel wire snare is a common survival-kit item. It's basic Survival equipment for trapping small game. $1, neg. LC4.

Rescue Signaling Devices (TL5)

When it isn't enough merely to survive, equipment beyond the tried-and-true signal fire can help signal rescuers. Except for the whistle, all of the items below grant at least +2 to Vision rolls made by a rescuer to spot the signaler, as long as there's a line of sight.

Whistle (TL5). Detected on an unmodified Hearing roll at 128 yards. $5, neg. LC4.

Hand Flare (TL6). A brightly burning road flare that can easily set fires. Lasts about 30 minutes. Illuminates a 5-yard radius. $5, 1 lb. LC4.

Signal Mirror (TL6). A signal mirror has a hole in the center for sighting on aircraft or ships. Under optimum conditions, it can generate 8 million candlepower and be seen over 50 miles away. At TL7+, it's made of silvered plastic to avoid breakage. $5, neg. LC4.

Pen Flare (TL7). A disposable, pen-sized launcher, often found on the sleeve of military flight suits. Shoots a colored signal flare to 70 yards. $15, 0.1 lb. LC4.

Strobe Marker (TL7). A palm-sized flashing light, visible up to 2 miles away. At TL8, a military-grade model acts as flashlight and has snap-on filter for infrared-only signaling (×5 cost). $25, 0.25 lb., XS/8 hrs. LC4.

Laser Rescue Flare (TL8). A powerful laser that can be seen by aircraft up to 10 miles away. The user aims it at the aircraft cockpit. $50, 0.1 lb., T/week. LC4.

Personal Rescue Beacon (TL7)

This is a radio beacon (p. 210) the size of a cigarette pack. It's tied into a global satellite network so that when the beacon is activated, rescue teams are notified. At TL7, the beacon is located via radio direction finders (pp. 38-39) mounted in rescue vehicles, and it might take rescuers 6 hours or more to get a fix. At TL8, location is determined from GPS (p. 53) data broadcast by the beacon – which is much more reliable – and the time from activation to an alert at a rescue center is a mere 3-10 minutes. $1,000, 0.75 lb., S/24 hrs. LC4.

Survival Kits (TL5)

Survival kits are optimized for the environment in which they'll most likely be used. This normally corresponds to one of the Survival specialties described on p. B224. The two basic categories are *land* and *aquatic;* kits intended for one give -3 to Survival when used for the other. A kit from a different specialty within the same category gives -1 to skill if the specialties are similar (e.g., an arctic kit in a mountain environment), -2 if they're very different (e.g., a desert kit when you need a jungle kit). A kit for Urban Survival (p. B228) *is* possible; it falls into its own category, giving -3 if used in place of any conventional kit, or vice versa.

It's difficult to generalize about what's "essential," since that's situational, but experts list these basic requirements:

- Fire starter (flint and steel, matches, or lighter).
- Food and water collection (fish hooks, snares, iodine tablets and plastic water bags, etc.).
- General-purpose utility tool (knife, axe, or machete).
- Shelter (life raft, sunshade, mosquito repellant or netting, etc.).
- Signaling device (whistle, flare gun, rescue beacon, etc.).

If the kit doesn't cover one of these areas, or if a class of gear is lost or used up, assess the -1 for "missing important items" (see *Equipment Modifiers,* p. B345). As the kit is depleted, it degrades to the level of improvised equipment at best. Good- and fine-quality kits are bigger because they include several items of each type, giving the survivor a backup in case something is lost or malfunctions. The best kits contain items that can't be used up or that work on wholly different principles (flint and steel, waterproof matches, *and* fire-starting paste).

Personal Basics (TL5)

This is basic equipment for a particular Survival skill specialty – the minimum that each person needs during a life-threatening situation in a specific environment. In all cases, it includes a knife of some sort, a light source and/or a fire starter, and some means to procure food and clean water. The specifics vary depending on the hardware available at the tech level (flint and steel instead of a lighter, cell phone in place of a signal mirror, etc.) and on the intended environment (money is much more useful than a fishing kit in an Urban Survival situation!). This gear alone might weigh 0.5 lb. or less.

However, many of the items in ***High-Tech*** *might* appear in a given adventurer's personal basics; e.g., cord (p. 56), duct tape (p. 26), eating utensils, first aid kit (p. 221), hip flask (p. 31), notebook (p. 17), towel (p. 31), and water bottle (p. 53). Prescription medicines (pp. 226-227) and a spare pair of contacts (p. 225) or glasses (p. 225), are also a good idea. In general, total cost is around 1% of the monthly cost of living (p. B265), and overall weight is about 1 lb.

Covert Survival Kit (TL7)

The ultimate in "minimalist," this is basic woodland survival gear concealed in the lining of a belt (p. 31): compass (p. 52), empty 1-quart plastic water bag, fishing kit (p. 58), matches (p. 57), micro-flashlight (p. 52), multi-function knife (p. 26), notebook (p. 17), sewing kit (p. 31), signal mirror (p. 58), snare (p. 58), water purification tablets (see below), wire saw (p. 25), and a few feet each of cord (p. 56) and duct tape (p. 26). $100, 0.5 lb. LC4.

Pilot's Survival Vest (TL7)

A jungle survival kit contained on a load-bearing vest (p. 54), this gives a +1 (quality) to Survival (Jungle). It includes: cigarette lighter (p. 57), compass (p. 52), emergency blanket (p. 57), empty 1-quart plastic water bag, fishing kit (p. 58), insect repellant (p. 221), magnifying glass (p. 57), matches (p. 57), multi-function knife (p. 26), pen flare (p. 58), signal mirror (p. 58), small first aid kit (p. 221), snares (p. 58), strobe marker (p. 58), sunscreen (p. 221), water purification tablets (see below), whistle (p. 58), and two snacks (p. 35). In addition to all this, military versions add a handgun and ammunition – and most pilots add a larger knife and either a small radio (p. 38) or a personal rescue beacon (p. 58). $250, 5 lbs. LC4.

Water-Processing Equipment (TL6)

The first priority in a long-term survival situation is to find a reliable water source. Leaving water in a clear, closed container on a reflective surface in the sun for six hours will kill any bacteria in it (a process called "solar water disinfection" or "SODIS"). Boiling water for 20 minutes also works. There are other ways to obtain potable water, however.

Chemical Desalter Kit (TL6). Standard equipment aboard life rafts and aircraft is a small box with eight bars of desalting chemical and a plastic bag. Each bar is dropped into a seawater-filled bag. Five minutes later, a quart of water is ready to drink. $25, 0.5 lb. LC4.

Water Filter (TL6). A water filter works by pushing water through some kind of filter medium (paper, charcoal, etc.). This gives a bonus equal to (TL-2) to HT rolls when drinking bacteria-ridden water (see *Contagion,* p. B443) but doesn't remove salt – for that, use a desalinator (below). It takes a minute to filter a quart of water. At TL8, divide weight by 8. $100, 8 lbs. LC4.

Water Purification Tablets (TL6). A tiny amount of chlorine or iodine can kill most bacteria in a water supply in about 30 minutes. The taste leaves a lot to be desired, but it *is* safe. A bottle of 50 tablets: $5, neg. LC4.

Solar Water Still (TL7). A plastic bag or a rubber bladder used to distill potable water from almost anything with water in it – cactus pulp, kelp, seawater, etc. The still works by evaporation, using the power of the sun. It produces up to a quart of potable water a day. Make a Survival roll to use it and gather the water. $30, 2 lbs. LC4.

Hand-Pumped Desalinator (TL8). This is modern lifeboat equipment. The pump filters a cup of water for every 10 minutes of pumping (costs 1 FP). A larger model (×3 cost and weight) produces a *quart* of water for the same effort. The filter lasts for 15,000 gallons. $500, 2.5 lbs. LC4.

MIOX Water Purifier (TL8). This pen-sized gadget uses an electrolytic process to create a chemical "cocktail" of *mi*xed *ox*idants (MIOX) that safely eliminates microbiological contamination in water. The battery-powered device uses table salt to produce a salty liquid that's left mixed with drinking water for 15 minutes to four hours, depending on the water's condition. After that, the water is safe to drink. $100, 0.25 lb., S/200 quarts. LC4.

UV Purifier (TL8). A UV light source inside a special one-quart container. Water exposed to the UV light for 1-2 minutes is safe from microbiological contamination. $100, 2.5 lbs. (full), 4×XS/20 quarts. LC4.

Comforts (TL7)

A few comforts from home are always welcome on the trail!

Camp Shower (TL7). A one-gallon shower bag. An hour of direct sunlight can heat it to over 90°F. $20, 2 lbs. LC4.

Chemical Toilet (TL7). A plastic bucket with seat. Kills bacteria and odors. $30, 7 lbs. LC4.

Clothes Washer (TL8). A hand-cranked washer that cleans up to 5 lbs of clothes in 2 minutes. $50, 4 lbs. LC4.

Espresso Maker (TL8). Prepares one serving in about 3 minutes. $10, 2 lbs. LC4.

Maritime Gear

The sea is a cruel mistress. It pays to enter her domain well-prepared.

Life Jackets (TL5)

The life jacket is *the* essential maritime life-saving device. The earliest models date to 1850s Britain, and were made from huge blocks of cork sewn into a canvas vest. Any life jacket gives +6 to Swimming rolls to avoid drowning (p. B354) but -3 in Quick Contests of Swimming when racing (see *Swimming,* p. B224).

Life Jacket (TL5). At TL5, cork-block construction gives -3 to Swimming rolls to avoid injury when first entering the water. At TL6-8, better materials eliminate this problem and weigh half as much. $10, 5 lbs. LC4.

Flotation Belt (TL6). A heavy webbing belt with two rubber tubes inside. It was issued by the thousands during WWII. When activated, two CO^2 cylinders inflate the belt. $15, 2 lbs. LC4.

Flotation Vest (TL8). A concealable life jacket – often incorporated into a load-bearing vest (p. 54). It can be manually activated or set to inflate automatically on entering the water. Its self-righting design will keep even an unconscious person's head out of the water. $150, 3 lbs. LC4.

Skin-Diving Equipment (TL6)

Modern skin diving got its start in the 1920s, when Guy Gilpatric began using aviation goggles while spearing fish in the French Riviera. The standard equipment we know today soon followed.

Dive Mask (TL6). See *Goggles* (p. 71).

Snorkel (TL6). This modern snorkel with a rubber mouthpiece lets a swimmer keep his face in the water while swimming on the surface. $25, 1 lb. LC4.

Swim Fins (TL6). Although Benjamin Franklin fiddled with an early prototype, modern swim fins were custom-made for divers during the 1930s. Commercial models appeared in 1940. Each fin requires a Ready maneuver to don or remove. They provide Enhanced Move 0.5 (Water) but reduce Move to 2 on land. $25, 3 lbs. LC4.

Miscellaneous Maritime Gear (TL7)

These items provide an extra degree of safety for those on the open water.

Dive Cage (TL7). A divers' shelter for shark-infested waters. It has space for up to three men. A buoyancy-control device allows use on or below the surface. DR 20. $3,000, 600 lbs. LC4.

Dye Marker (TL7). A container of fluorescent dye. Released in water, it takes 3d seconds to make a luminous circle 30' in diameter, which gives +2 to Vision rolls to see it. It lasts for about half an hour in normal sea conditions. $5, 0.5 lb. LC4.

Life Raft (TL7). A round, high-visibility, self-inflating raft for one in a soda can-sized package – with weather canopy, sea anchor, etc. A larger, four-person model is also available (×3 weight and cost). $50, 5 lbs. LC4.

Emergency Beacon (TL8). This wrist-worn, short-range radio beacon triggers automatically if submerged and can also be activated manually. It is part of the "man-overboard system" common on yachts and commercial fishing boats. When activated, an alarm sounds aboard the vessel and a shipboard radio direction finder (pp. 38-39) indicates distance and direction to the beacon. Each locator can be assigned a coded ID so that it reveals the survivor's identity as well. $300, 0.25 lb., XS/8 hrs. LC4.

Rebreathers (TL7)

Diving rebreathers actually predate conventional scuba gear and were first used as submarine escape equipment. Since they recirculate the diver's exhaled gases instead of exhausting them, they draw much less attention on the surface – a useful trait for military divers. For details, see *Rebreathers* (p. 76).

Scuba Gear (TL7)

French naval officer Jacques-Yves Cousteau and Air Liquide engineer Emile Gagnan produced a working model of the "aqua-lung" in 1943. Models reached the U.S. in 1948. By 1958, over 25,000 had been sold – thanks in no small part to the TV adventure series *Sea Hunt*.

A scuba (*s*elf-*c*ontained *u*nderwater *b*reathing *a*pparatus) setup is an "open-circuit" breathing system – it releases the diver's exhaled breaths into the water. Such gear is wasteful of air but simple to operate compared to a "closed-circuit" rebreather (p. 76). Its biggest limitation is that it's restricted to relatively shallow dive depths.

Micro-Scuba Rig (TL7). A complete breathing rig with mouthpiece, regulator, etc., used as a backup by divers if their main system malfunctions. It provides air for 30-60 breaths; see *Holding Your Breath* (p. B351). Holdout -3. $200, 2 lbs. LC4.

Scuba Gear (TL7). A comprehensive set of scuba-diving equipment: wetsuit, dive mask, snorkel, fins, buoyancy compensator, medium air tank, regulator, weight belt, and so on. See Chapter 4 for details on air tanks and scuba masks. $1,500, 45 lbs. LC4.

Parachuting Gear

In 1797, André Garnerin leapt out of a hydrogen balloon 3,200' above Paris . . . and survived, courtesy of his invention, the first practical parachute. Interest in this technology grew enormously with the development of powered flight in TL6.

The first widespread use of parachutes was during WWI – initially as an escape device for balloonists, and later for pilots and even spies. In the 1920s, the Soviets conducted the first military exercises with parachute infantry, proving that a force could be landed behind enemy lines. Whole *armies* of parachutists were organized during WWII. Many countries maintain "airborne" units today; 100 U.S. Army Rangers parachuted into Afghanistan in 2001, and 1,000 airborne troops landed on a single airfield in Iraq in 2003.

Parachutes aren't exclusively safety gear and military kit. The civilian sport of skydiving blossomed in the '60s and '70s, thanks to safer parachutes and better training. *All* types of parachutes and parachuting use the Parachuting skill (p. B212).

Parachutes (TL5)

A parachutist must make a Parachuting roll to use his equipment correctly on a jump. After pulling the ripcord on his parachute, he'll fall a minimum of 80 yards before the canopy opens completely. Should he hit the ground before then, assume that he has *half* the usual velocity for the fall. Once his chute is entirely open, he falls at 5 yards per second (variables include canopy size, parachutist weight, thermals, etc.), and drifts with the wind. Add 1 yard per second to landing speed per 50 lbs. over the parachute's maximum rated weight. A chute carrying 120% or more of its rated weight simply *fails.* Ram-air devices differ in several ways (see below).

Beginning at TL8, most parachutes are equipped with an automatic barometric actuating device that deploys the canopy at a preset altitude – usually 1,000'. This safety feature prevents an unconscious jumper from plummeting to his death. Of course, it can malfunction or be *intentionally* deactivated (or sabotaged!).

It takes 10 seconds to put on a parachute, 2 seconds to take it off.

Parachute (TL5). The earliest experimental parachutes had no hole in the top to allow air to escape, so they oscillated ferociously. Parachutists jumping with these poorly designed parachutes must make a HT-4 roll to avoid becoming nauseated (p. B428). Maximum suspended weight is 150 lbs. $500, 50 lbs. LC4.

Parachute (TL6). One of the first commercial parachutes was the Guardian Angel, sold in England from 1917. This is a standard round parachute opened by a static line or by hand. It isn't controllable and thus relies on the jumpmaster and the aircraft pilot for accuracy in hitting the drop zone. The current U.S. Army T-10 is very similar. Maximum suspended weight is 150 lbs. (200 lbs. at TL7, 250 lbs. at TL8). A reserve chute adds $250, 15 lbs. $750, 30 lbs. LC4.

Mini-Parachute (TL8). A parachute in a slim backpack that can be concealed under a jacket (×5 cost) with rip-away back panels. One model is marketed as a high-rise building escape device. It opens in *half* the distance of a normal chute. $1,000, 8 lbs. LC4.

Parachute Navigation Device (TL8). This gadget combines GPS (p. 53) and a helmet-mounted HUD to project a directional arrow that guides the parachutist to his landing zone. Military models are designed to work with night-vision goggles. $1,500, 1 lb., XS/20 hrs. LC3.

Ram-Air Parachute (TL8). At TL8, sport jumpers and high-altitude military parachutists favor airfoil-style parachutes. Such a chute is highly maneuverable. It can glide at Move 15 relative to the ground – and with a good tailwind at 20,000', jumpers routinely cruise as fast as Move 35, flying dozens of miles under canopy in the right conditions. This allows black-ops teams to exit an aircraft at great altitude and fly in formation to a distant drop zone. Jumpers attempting such stunts require an air mask (pp. 72-73) and air tanks (p. 74) to avoid passing out due to lack of oxygen; see *Atmospheric Pressure* (p. B429). Maximum suspended weight is 400 lbs. For performance data as vehicle, see the *Air Conveyances Table* (p. 232). With reserve: $3,500, 25 lbs. LC4.

Aerial Resupply (TL6)

Sometimes, the only way to get equipment to people on the ground – be they smokejumpers, scientists in Antarctica, or troops in an area too hot for a helicopter landing – is to deliver it from the sky.

Parachute Container (TL6). A typical WWII-era cargo container, this packet holds 250 lbs., or 5 cubic feet, of gear. With parachute deployed, it descends at 6 yards per second, drifting with the wind. Military chutes are often color-coded (blue for mail, green for ammunition, red for medical supplies, etc.). $50, 25 lbs. LC4.

> *The parachute blossoms, braking my fall, and I'm rocking gently in the winter sky. Below me, the hills and fields are crawling with Germans.*
>
> *– General Chuck Yeager,* ***Yeager: An Autobiography***

Guided Parachute Delivery (TL8). Using GPS (p. 53) to guide the parachute via a strap-on control pack and a set of control arms that look like shock absorbers, a GPD can deliver cargo (like a parachute container, above) to preset coordinates. Such a system – like the U.S. military's Joint Precision Airdrop System (JPADS), used in Afghanistan and the Iraq War – can steer itself to within a few dozen yards of the programmed landing point. It cruises at Move 10-15 relative to the ground. Maximum cargo load is 5 tons. $70,000, 50 lbs. LC3.

Infiltration Pod (TL8). This is a streamlined *human* cargo pod, like the EXINT (extraction/insertion) pod from London-based AVPRO. It holds one person and attaches to an aircraft's hardpoints; a single AH-64 Apache helicopter can carry four. The occupant has a radio, a navigation display, and life support – but no controls! A GPS-guided control system steers the pod precisely and lands it safely using a combination of parachute and airbags. Maximum cargo load, including occupant, is 500 lbs. $100,000, 700 lbs. LC3.

Death from Above

A parachutist may need to dispatch an unwanted welcoming committee as he nears the ground. This requires a Move and Attack maneuver, with a penalty equal to the weapon's Bulk or -2 (whichever is worse). Roll against the *lower* of Parachuting or ranged weapon skill to hit. Paratroopers who often find themselves in this predicament might benefit from the Mounted Shooting technique (p. 251).

Chapter Four
Defenses

The blast deafened Airk even as he felt the buckshot smash into his back. The impact knocked him off-balance, but he rolled as he hit the wooden slats at the bottom of the trench. Splinters erupted around him as the Centrum op blazed away with his shotgun but failed to connect.

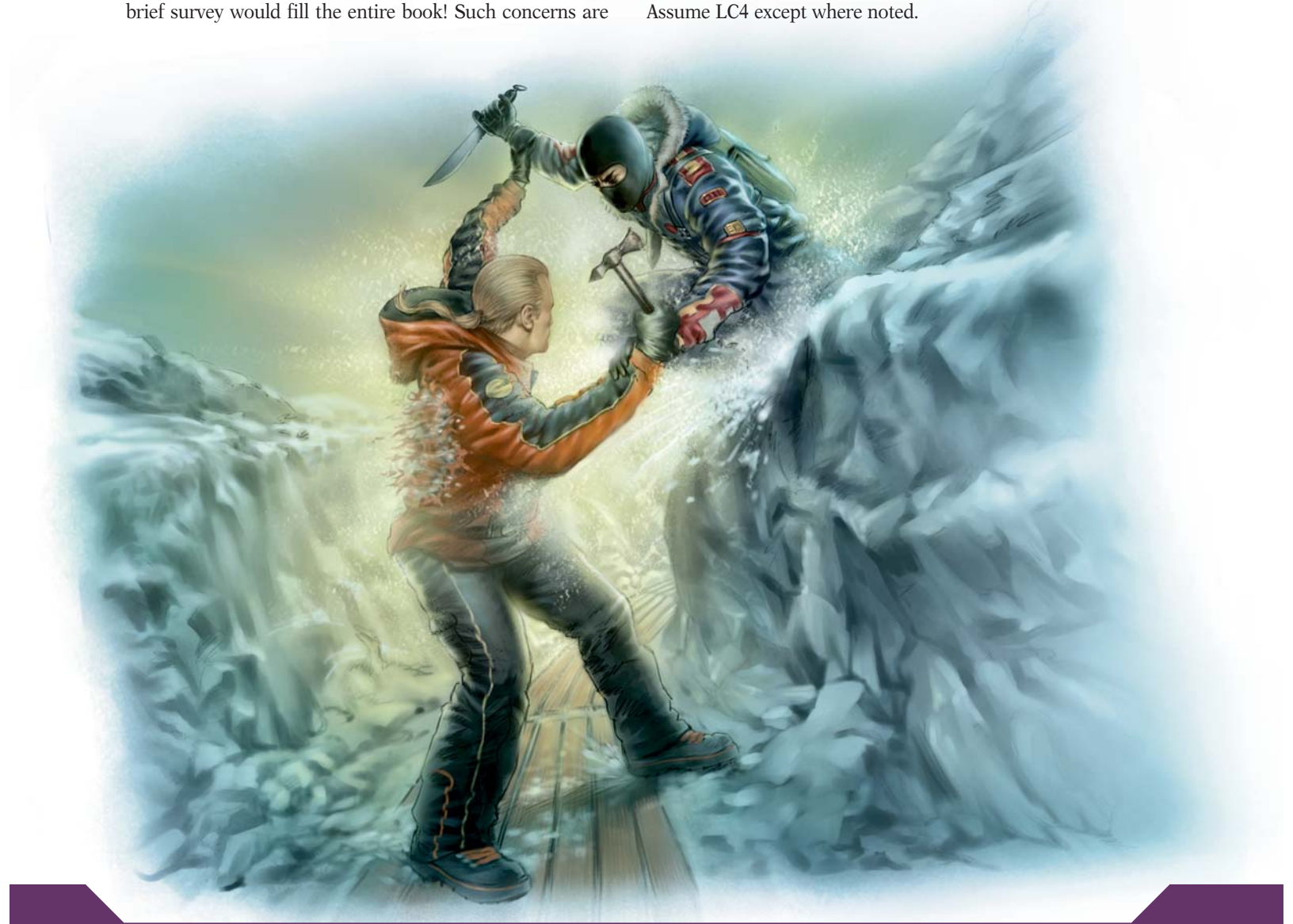
Somehow Airk remembered the 'hawk in his belt and spun up out of his crouch just in time to meet the bared-teeth rush of another Interworld agent leaping from the top of the trench . . .

Adventurers face a multitude of dangers and disasters, natural and man-made. Fortunately, technology provides defenses against threats of all types – including cold, heat, pressure, and toxic atmospheres.

Clothing

Clothing is often the only barrier between an adventurer and frostbite, sunburn, heat stroke, or even death . . . not to mention *social* calamities. The clothes in this section are described generically, to make them useful in any setting. Specific styles are intentionally given short shrift – even a brief survey would fill the entire book! Such concerns are left to the GM. Any good reference work on historical fashions will offer a wealth of inspirational descriptions and illustrations.

Note that *Styling* (p. 10) often applies to clothing, and that clothes come in all the usual quality levels (p. B345). Assume LC4 except where noted.



Clothing Types

These notes elaborate on the *Clothing* rules on p. B266. Weights assume TL7 garments; to adjust weight for other TLs, see *Clothing Materials and Technology* (pp. 64-65). The complete outfits below include the *cost* of appropriate footwear but not its weight; see *Footwear* (pp. 68-69) for that.

Summer Clothes

This is lightweight clothing – perhaps a thin, white Arabian *thobe; ao ba ba,* the black pajamas of Vietnam's Mekong Delta region; or swim trunks and a t-shirt. It's light, comfortable, and cool. In hot weather, loose clothes allow air to circulate and cool the body. They aren't always white; traditional black Bedouin robes absorb more sunlight than white garments, but this actually increases sweat evaporation by drawing more air through the cloth, so they *feel* cooler. If robes aren't de rigueur in the campaign's desert climes, lightweight clothing such as pants, a long-sleeved shirt, and a broad hat will prevent sunburn (p. B434). Cost is 10% of cost of living; weight is 1 lb.

Ordinary Clothes

This is typical work wear or everyday dress for a *temperate* climate: military uniform, shirt and trousers, t-shirt and bib overalls, etc. Even this much clothing may increase FP costs in hot climates, as described under *Fighting a Battle* (p. B426). Cost is 20% of cost of living; weight is 2 lbs.

Frostbite

Frostbite is acute somatic damage to exposed flesh caused by freezing. It's distinct from FP and HP losses to hypothermia (see *Cold,* p. B430), which represent *metabolic* damage. The two effects can and often do occur simultaneously! At the GM's option, those exposed to freezing conditions lose 1 HP on any exposed hit location per FP lost to cold. This can cripple extremities or even limbs, and is cumulative with injury due to hypothermia.

Winter Clothes

This is outdoor clothing for colder climes. It may be as simple as a jacket or a coat over ordinary clothes (above), or as specialized as insulated coveralls. In freezing temperatures, it allows a HT roll at no penalty to avoid FP loss (see p. B430). For an outfit to count as winter clothes, it must protect the *whole* body against heat loss – particularly feet, hands, head, and neck (e.g., waterproof boots, gloves, a warm hat, and a scarf). If there are missing items, the GM may penalize HT rolls with the -1 per item recommended on p. B345. Cost is 30% of cost of living; weight is 4 lbs.

Arctic Clothes

This is an outfit similar to winter clothes (above), but with multiple layers and a water- and windproof exterior to help retain body heat and protect against biting arctic winds. Through TL6, furs, oilcloth, and greased wool or felt are common; at TL7-8, lighter materials appear. All such clothing gives +5 to HT rolls to avoid FP or HP loss due to freezing temperatures (see p. B430). As with winter clothing, if crucial items – gloves, hat, etc. – are missing, the outfit loses much of its effectiveness. When necessary, the wearer can remove a few layers to allow arctic clothing to act as winter or ordinary clothes. Cost is 50% of cost of living; weight is 15 lbs.

> *This may smell bad, kid . . . but it will keep you warm . . . 'til I get the shelter built.*
> *– Han Solo,* ***The Empire Strikes Back***

Formal Wear

Top hat and tuxedo, waistcoat and kilt, sequined evening gown and Pierre Cardin handbag . . . these are clothes for stepping out in. Fashion dictates the exact style and cut that's "in," but one thing is for certain: it isn't cheap. Cost starts at 40% of cost of living; weight is 2 lbs.

High-Fashion Attire

This represents ridiculously luxurious materials crafted by the world's top designers, with glitz and glam to the hilt. Many high-fashion designs disregard the normal conventions of dress and decorum; some seem to defy the laws of physics. The chichi fabrics are equally outrageous: lace tatted by blind nuns, Andean vicuña cashmere, handwoven Thai silks, etc. Of course, the price for an original Oscar de la Renta or Jean-Paul Gaultier is astronomical. Cost *starts* at 100% of cost of living for Status 2 or above; weight is 1-4 lbs.

Clothing Accessories

Trimmings help complete any outfit. Attention to such details is crucial when stepping out in high society!

For men, sleeve garters adjust the one-size-fits-all sleeves of TL5 shirts. Cufflinks are another important accessory – required for TL5 and often TL6 shirts, which lack cuff buttons, and stylish even today. During all of TL5-8, a necktie or a cravat adds color and distinction to a shirt. Well into TL7, hat, handkerchief, and pocketknife are also considered part of any *respectable* gent's ensemble.

For women, hosiery is a top priority through TL5-8. This includes leg garters in the days before nylon pantyhose, which stays up on its own (TL7). Trends in hats, gloves, handbags, and so on fluctuate annually. Veils are common in many times and places – for modesty, mystique, or protection from sunlight, dust, and insects.

Characters start with accessories appropriate to their Status. Bought separately, such items cost 1% of cost of living per "outfit." Weight is negligible.

Special Clothing

Certain "extras" can add functionality and/or flair to any of the outfits above.

Hat (TL5)

Historically, man has worn many types of head coverings. Materials include wool (often felt), cotton, and leather. Styles, too, are highly variable – baseball caps, cowboy hats, derbies, fedoras, watch caps, and so on. Hats prevent sunburn, retain body heat, and/or keep rain out of the wearer's face. They can be decorative or utilitarian, distinctive or ubiquitous (perhaps even helping someone blend into the crowd). Prices run from around 1% of cost of living for cloth caps to 10% of cost of living for leather or felt hats. Weight is negligible for most cloth; 0.5-1 lb. for leather or felt.

Long Coat (TL5)

This is a trench coat, duster, overcoat, or similar item that covers the torso and extends to the knees or below. It can easily conceal bulky items (+4 to Holdout) but may look out-of-place in certain settings. It *can* be bought as undercover clothing (below) to increase its Holdout bonus. A leather version (×5 cost, ×2 weight) gives DR 1. $50, 5 lbs.

Undercover Clothing (TL5)

Clothing designed to hide things gives a Holdout bonus, cumulative with that for a concealable holster (p. 154). This may be accomplished through a special cut, hidden pockets and reinforcements, panels, etc. An outfit that gives +1 (quality) to Holdout has 5× its usual cost; +2 (quality) is 20× normal cost.

Wet-Weather Gear (TL5)

Rain and spray can greatly reduce the effectiveness of clothing in cold weather (see *Cold,* p. B430). At TL5-6, wet-weather gear is a thick "gum" blanket or poncho; at TL7-8, it's a lightweight synthetic suit. Because of their bulk, ponchos and the like grant +4 to Holdout when trying to conceal gear on the body. Cost and weight are as for ordinary clothes of the appropriate TL.

Wicking Undergarment (TL8)

This special clothing was originally designed to be worn under body armor and later adapted for athletic use. Its fibers draw moisture away from the skin, helping keep the wearer dry and facilitating evaporative cooling. Gives +1 to all HT and HT-based rolls to avoid FP loss in hot weather (see *Heat,* p. B434). $30, neg.

Clothing Materials and Technology

The materials and features available for clothing advance alongside the rest of technology. Still, many people at TL8 happily wear clothes that have changed little since TL6 – even if soldiers and athletes favor state-of-the-art outfits. ***High-Tech*** splits the difference and uses TL7 as its baseline.

TL5

At TL5, clothing is made from natural materials. Wool is a common choice in Europe and North America, but while sturdy, warm, and attractive, it is stifling in hot weather, absorbs and retains water (and dries slowly), and is difficult to keep clean. Cotton, breathable and lightweight, is popular in warmer areas. In colder climes, fur or fur-lined clothing is usual – fox, caribou, reindeer, bison, etc. Winter or arctic clothes made from fur are often heavy and cumbersome, but may provide DR 1 (GM's option).

Most waterproof clothing at TL5 is made of oilcloth: heavy canvas treated with oil and/or paraffin. At mid-TL5, an alternative is a stiff "gum" fabric painted with rubber. A rubberized coat is called a "slicker" – or sometimes a "Mackintosh," in honor of its inventor.

The principal fasteners at TL5 are buckles and buttons, although brass eyelets and hook-and-eye arrangements also see use. Easily lost buttons combined with easily soiled natural fabrics make it challenging to keep clothes serviceable and attractive. Housekeeping (p. B200) and Sewing (p. B219) are vital maintenance skills!

TL6

With TL6 come *many* improvements. The garment industry takes its first steps into the Plastic Age with Bakelite buttons, PVC-impregnated hats, and two light, comfortable, and attractive fabrics: rayon and nylon. Less obvious but no less important is the standardization of clothing sizes.

Two innovative fasteners appear at TL6: the metal snap and the awkwardly named "Automatic, Continuous Clothing Closure." The latter becomes famous as the "zipper" after the B.F. Goodrich Co. uses it on its Zipper-brand galoshes. The zipper quickly spreads from the footwear business to the entire clothing industry.

A more prosaic TL6 development is the belt loop. Previously, suspenders were the accessory of choice for holding up trousers, while a belt was considered a *tool* for carrying equipment. The famous miner's "waist overalls" sold by Levi Strauss didn't incorporate belt loops until 1922.

Foul-weather gear improves during TL6, too. Quilted goose-down clothing – first sold as the Skyliner jacket by Seattle outfitter Eddie Bauer – reduces the bulk of arctic clothes. Vinyl-treated cloth makes a lightweight, if flimsy, waterproof overcoat.

TL7

Synthetic fabrics continue to play a major role at TL7, as acrylic, polyester, and Dacron usher in the age of wash-and-wear clothing. These materials require much less maintenance than wool and other natural textiles, yet can be just as attractive. The first generation of synthetic *insulation*

emerges, too, in the form of Lycra (also called Spandex) and polypropylene. Hook-and-loop fasteners, such as the popular Velcro brand, are another TL7 creation.

TL8

At TL8, breathable, waterproof fabrics revolutionize active wear. Acrylic fleece and lightweight synthetic insulation dramatically reduce the weight and bulk of cold-weather clothing. Natural fibers meet synthetic treatments in the form of "microfiber": fabrics woven from threads a fraction the thickness of a human hair. The resulting clothing is water- and stain-resistant, attractive, and comfortable – it can handle the toughest punishment and still look good.

Clothing Technology Table

This table shows how the innovations in *Clothing Materials and Technology* (pp. 64-65) affect the weight of the outfits under *Clothing Types* (p. 63). Select the outfit's type and TL, and multiply its weight by the corresponding factor in the table; e.g., TL8 arctic clothes weigh 15 lbs. × 0.5 = 7.5 lbs.

Type	*TL5*	*TL6*	*TL7*	*TL8*
Any *but* Arctic	×2	×2	×1	×0.5
Arctic	×1.5	×1.25	×1	×0.5

Armor and Protective Gear

A wide array of armor and protective equipment appears at TL5-8. These items are listed in approximate order of appearance within their TL, to make it easier for the GM to decide whether they exist yet in a campaign set at that TL. See *Armor Tables* (p. B282) for an explanation of the notation and abbreviations used in this section's tables.

Body Armor

Body armor is heavy, and stifling even in temperate conditions. In hot weather, it increases FP costs (see *Fighting a Battle,* p. B426) and can contribute to heatstroke (see *Heat,* p. B434). To mitigate heat problems, use a climate-control system (p. 74) or wear a wicking undergarment (p. 64).

Torso Armor

Steel Vest (TL5). A concealable armor vest, relatively lightweight and cheap. An example is the Soldiers' Bullet Proof Vest, produced by carriage-maker G. & D. Cook & Co. of New Haven, Connecticut during the American Civil War. It was a standard, military-style blue vest with pockets for two steel plates in the front. These overlapped in the center where the vest buttoned. Infantrymen thought it too heavy and hot during long marches – and of little value against musket fire in any event. Nevertheless, it was a common sight on the battlefield. Legend has it that Wyatt Earp wore one, although he vehemently denied it.

Steel Corselet (TL5). The body armor of the heavy cavalryman. Before WWI, every major European government had at least one regiment of *cuirassiers* – big men on big horses, trained to charge home with the sword. Their armor was highly polished for show (and often used as a mirror!), but had a cloth cover for field duty.

Silk Vest (TL6). A thickly padded silk vest of the type often worn by affluent gentlemen. Most observers who notice it are unlikely to assume that it's armor. A famous example is the tightly woven vest that Catholic priest Casimir Zeglen developed after the 1893 murder of a popular Chicago mayor. The London *Daily Mail* reported that none other than Archduke Franz Ferdinand, heir to the Hapsburg dynasty, was wearing such a vest the day he was assassinated; other accounts suggest that he declined to wear it in Sarajevo's stifling heat. Regardless, the bullet struck him in the neck and he bled to death in minutes from a severed jugular vein. During the Russo-Japanese War, 50,000 vests with a steel plate sandwiched between silk padding were issued to Russian troops.

High-Tech Low-Tech

Versions of the low-tech armor on pp. B283-284 still see use at TL5-8. Notably, scuba divers and industrial workers wear high-tech mail, while reenactors construct modern versions of ancient armor from TL8 materials.

Steel (TL5). Metal armor (mail, scale, plate, etc.) and shields built using TL5+ steel and machining enjoy *twice* the DR of their low-tech equivalents; cost and weight don't change. Alternatively, *halve* cost and weight without doubling DR.

Smart Foam (TL8). This foam is made from "shear thickening liquid" – a substance that is normally quite flexible but becomes rigid on impact. It's concealable under normal clothing. It provides DR 4 vs. crushing damage, DR 1 vs. all other damage. Weighs the same as cloth armor, but cost is ×10.

Titanium (TL8). Metal armor and shields made of titanium offer the same DR as their low-tech equivalents at 1/3 normal weight. Cost is ×5.

Composite Body Armor (TL6). A cuirass and groin protector made from layers of resin-impregnated silk, linen, and cotton. An example is the Chemico Body Shield, made by the Country Chemical Company of Birmingham, England. About an inch thick, it had a duck cloth cover with ammunition pockets on the front. It was the only practical body armor issued to British troops during WWI – and only from 1917.

Sentry Armor (TL6). A steel breastplate such as the *Infanterie-Panzer,* worn by German soldiers during WWI. Nicknamed *Sappenpanzer* ("trench armor"), some 500,000 were issued – mostly to machine gunners and sentries.

Torso Armor Table

TL	Armor	Location	DR	Cost	Weight	LC	Notes
5	Steel Vest	torso	5F	$150	7	4	[1]
5	Steel Corselet	torso	10	$600	12	4	
6	Silk Vest	torso	4/2*	$800	6	4	[1, 2]
	+ *Steel Plate*	torso	+5F	+$400	+6	4	
6	Composite Body Armor	torso, groin	4	$150	6	4	
6	Sentry Armor	torso, groin	14F	$300	20	4	
6	Light Body Armor	torso, groin	5	$1,000	9	4	[1]
6	Bulletproof Vest	torso	6	$750	8	4	[1]
7	Flak Vest	torso	7	$500	20	4	
7	Fragmentation Vest	torso, groin	6	$200	13.5	4	[3]
7	Improved Fragmentation Vest	torso	4/2*	$400	8	3	[2]
	+ *Trauma Plates*	torso	+18	+$3,600	+15	2	
7	Aircrew Armor	torso	20F	$600	15	3	
7	Shoulder Pads	torso, arms	3/1	$50	5	4	[4]
8	Fragmentation Vest	torso, groin	5/2*	$350	9	3	[2]
	+ *Trauma Plates*	torso	+25	+$350	+16	2	
8	Early Concealable Vest	torso	8/2*	$200	2.5	3	[1, 2]
8	Concealable Vest	torso	12/5*	$1,000	2	3	[1, 2]
8	Assault Vest	torso, groin	12/5*	$900	8	2	[2]
	+ *Trauma Plates*	torso	+23	+$600	+8	2	
8	Anti-Stab Vest	torso	5F*	$300	4	4	
8	Advanced Body Armor	torso	35/5*	$4,600	17	2	[1, 5]

Notes:

[1] Concealable *as* or *under* clothing.

[2] Split DR: use the first, higher DR against *piercing* and *cutting* attacks; use the second, lower DR against *all other damage types*.

[3] Provides DR 8 to the vitals from the front.

[4] Protects the torso (1/6) and arms (1/6). Use DR 3 against *crushing* attacks; use DR 1 against *all other damage types*. Gives +1 to damage inflicted and DR 3 against damage received when *making* a slam (p. B371).

[5] Use the lower DR versus *crushing attacks only.*

Light Body Armor (TL6). Steel armor with thick, sponge-rubber padding. It covers both front and back, and is designed to protect against shell splinters and pistol bullets. Arm and leg protection is also available (pp. 67-68). The Engineering Division of the U.S. Ordnance Department developed it during WWI. Mainly experimental, but small lots were sent to France in the war's closing days.

Bulletproof Vest (TL6). A vest of overlapping steel plates riveted between layers of cloth, made to look like an ordinary suit vest. It covers the front and back of the torso. In the 1920s and 1930s, Elliott Wisbrod's Armored Police Vest Company marketed a concealable vest that became a favorite of criminals and government agents alike; the Dunrite Manufacturing Company sold similar body armor. Wisbrod launched a unique national publicity campaign to demonstrate his confidence in his product: he was shot in the chest in front of crowds of police officers, city officials, and curious onlookers in cities all over the U.S.! His campaign worked. Baby Face Nelson and John Dillinger were repeat customers, and even Franklin Roosevelt and Joseph Stalin were reported to have worn Wisbrod vests. Japanese troops during WWII wore similar gear.

Concealing Armor

To conceal armor from somebody who's looking for it, you must *win* a Quick Contest of Holdout (p. B200) vs. his Search skill (p. B219). Holdout suffers a penalty equal to DR for rigid armor, DR/3 (round up) for flexible armor. Armor designed specifically to be concealed gives +1 to +4 toward negating this penalty. Also add the bonus for clothes worn *over* the armor (e.g., *Long Coat,* p. 64, and *Undercover Clothing,* p. 64). Range penalties apply to Search.

Flak Vest (TL7). "Flak" is an abbreviation for *Fliegerabwehrkanone,* German for "anti-aircraft gun." The flak vests of WWII were designed to protect flight crews against anti-aircraft shell bursts. The American M1 was made of Hadfield manganese steel riveted to a nylon backing. It was heavy, bulky, and not designed to be concealed.

Fragmentation Vest (TL7). A nylon vest with aluminum plate inserts to shield the vitals from the front. It's intended to protect against fragments from artillery and hand grenades, not to stop bullets. The U.S. Marine Corps ordered 50,000 such vests in the closing days of WWII – too late to see action in that conflict. They were used extensively in Korea, however.

Improved Fragmentation Vest (TL7). A typical protective vest constructed of ballistic nylon or similar fibers. Examples include the U.S. M1952 and M69, worn by American ground troops in the Korean and Vietnam Wars. Some models can be fitted with heavy ceramic-fiberglass plates; vehicle drivers, tankers, and boat crews were issued such plates in Vietnam. The table lists the vest, plus a set of front *and* back plates (7.5 lbs. apiece).

Aircrew Armor (TL7). A rigid aluminum oxide and glass-reinforced plate inside a ballistic nylon carrier. Such armor was issued by the U.S. Army from 1966; helicopter crews called it "chicken plate." The table entry assumes a vest with only a single plate in the front of the carrier, as worn by pilots and copilots. Helicopter door gunners wore a back plate as well. This provides protection for the front *and* back of the torso, but increases cost to $1,100 and weight to 34 lbs.

Shoulder Pads (TL7). This is gridiron armor for American-style football. It protects the upper torso and shoulders.

Fragmentation Vest (TL8). At TL8, frag vests use aramid fibers that are five times stronger than steel. An example is the Personnel Armor System for Ground Troops (PASGT) vest, adopted by the U.S. Army in 1976. Later versions – such as Germany's Mehler *Splitterschutzweste MIL-120* – are much lighter (5.7 lbs.) and better-designed. In the 1990s, the PASGT vest was upgraded with a carrier for ceramic plates (8 lbs. each) and called the Interim Small Arms Protective Overvest, or ISAPO (DR 30, $700, 25 lbs.).

Early Concealable Vest (TL8). A concealable vest representative of those on the market since the late 1970s. It may be available in *TL7* campaigns set during this period (GM's option).

Concealable Vest (TL8). The lightest and most concealable protective vest *currently* on the market. It can be fitted with a trauma plate (see box).

Assault Vest (TL8). A heavy ballistic vest, worn by SWAT teams and soldiers. The removable trauma plates provide protection against rifle-caliber weapons; the groin protector is also detachable. The Interceptor OTV (Outer Tactical Vest) is the current U.S. military-issue vest in Iraq and Afghanistan.

Anti-Stab Vest (TL8). A tight-weave ballistic vest – like those in the EnGarde Eagle Eye series – that can stop impaling damage as well as other attacks. It's worn by corrections officers, and by police in areas with high levels of violent crime that doesn't involve firearms (stabbings, beatings, etc.).

Advanced Body Armor (TL8). Pinnacle Armor's SOV looks like a run-of-the-mill tactical ballistic vest – albeit thinner – but is much more advanced. Instead of relying on bulky plates, it takes a so-called "scalar" approach, using overlapping ballistic-resistant scales (each 2"-3" in diameter) made from a patented titanium-ceramic matrix. This makes it the only *concealable* vest capable of resisting rifle fire over the whole torso rather than just the vitals. Gives +4 (quality) to Holdout attempts to conceal it.

Limb Armor

While neither as popular nor as essential as torso armor (pp. 65-67) and headgear (pp. 69-70), limb armor has occasionally found its way onto the modern battlefield. These items protect the entire length of the limb – and both its front and its back – unless specified otherwise. Exceptions use the notation explained in *Hitting 'Em Where It Hurts* (p. 69).

Chaps (TL5). *Chaparreras* are worn by cowboys to protect from thorns and scrub brush while working cattle.

Trauma Plates (TL8)

At TL8, soft ballistic vests typically have built-in pockets for removable "trauma plates" or "anti-stab plates." Such plates increase the armor's cost and weight, but significantly enhance the protection it affords. Assume that plates are available for any flexible torso armor.

Ballistic plates are rigid, and greatly increase a vest's bulk. Those made from ceramic are also *brittle* – they work by cracking, which absorbs some of the bullet's energy, and lose effectiveness after a small number of shots. The GM who enjoys gritty realism may treat trauma plates as semi-ablative DR (p. B47).

Anti-Stab Plate (TL8). A small plate of lightweight metal alloy, intended for protection against knife attacks, not firearms. It covers the vitals from the front only. Gives +4 DR. $150, 0.5 lb. LC3.

Small Trauma Plate (TL8). A small ceramic plate that protects the vitals from the front only. Gives +25 DR. $250, 3 lbs. LC3.

Trauma Plate (TL8). A *large* ceramic plate that protects the entire torso from either the front or the back – two are needed for full torso coverage. Gives +25 DR. $500, 4 lbs. LC3.

Shin Guards (TL5). Steel greaves were developed for soldiers during the American Civil War, but used only briefly. They protect only the lower leg (2/6 protection) – and only from the *front*.

Light Body Armor (TL6). This is part of the experimental steel armor developed for trench fighting during WWI (see also "Light Body Armor" under *Torso Armor,* p. 66). While 50 sets were shipped to France before the Armistice, it's doubtful that any of it saw combat. It has foam-rubber backing and is painted a dull khaki or olive drab color. The armor covers most of the limb (5/6 protection).

Aircrew Leg Armor (TL7). A heavy ballistic shin guard of the type worn by helicopter crewmen during the Vietnam conflict. It protects the *front* of the lower leg, from just above the knee to the ankle (3/6 protection).

Riot Gear (TL7). A set of leggings and sleeves made from thick plastic backed with padding. It's worn by riot-control and corrections officers. It can blunt the impact of a thrown rock or brick, and is light enough to wear in a foot chase. Very similar armor is used in many contact sports.

Ballistic Leggings (TL8). Flexible, ballistic-fabric leggings, worn by assault troops. They're bulky and not easily concealed.

Sharp-Protective Armor (TL8). A layer of ballistic fiber worn by corrections officers, lumberjacks, and industrial workers exposed to "sharps" during the work day. It's easily concealed under clothing.

Deltoid and Axillary Protectors (DAP) (TL8). "DAP" is military-speak for an upper-arm protector worn with an assault vest. The flexible ballistic cloth covers from just above the elbows to the shoulders (2/6 protection).

Limb Armor Table

TL	Armor	Location	DR	Cost	Weight	LC	Notes
5	Chaps	legs	1*	$40	2	4	
5	Shin Guards	legs	4F	$50	1.5	4	
6	Light Body Armor	arms	4	$300	5	4	
6	Light Body Armor	legs	4	$350	8	4	
7	Aircrew Leg Armor	legs	15F	$200	18	3	
7	Riot Gear	arms	3	$100	2	4	
7	Riot Gear	legs	3	$100	4	4	
8	Ballistic Leggings	legs	12/5F*	$400	8	4	[1]
8	Sharp-Protective Armor	arms	3/1*	$100	2	4	[2, 3]
8	Sharp-Protective Armor	legs	3/1*	$100	4	4	[2, 3]
8	DAP	arms	8/2*	$200	5	4	[1]

Notes:

[1] Split DR: use the first, higher DR against *piercing* and *cutting* attacks; use the second, lower DR against *all other damage types*.

[2] Split DR: use the first, higher DR against *impaling* and *cutting* attacks; use the second, lower DR against *all other damage types*.

[3] Concealable *as* or *under* clothing.

Footwear

At TL5, shoes are a simple affair, only approximately sized to the feet, with square toes. There's no such thing as a right/left pair. Leather or canvas gaiters are worn to protect the tops of the shoes, shoelaces, and calves. At TL6, shoes are built for either the left foot or the right foot, and come in standard sizes. Other advances include rubber soles, steel shanks for arch support, and waterproofing. At TL7-8, synthetic footwear is breathable and long-wearing, with athletic shoes becoming much better fitting and more supportive.

Footwear can be a deciding factor in the success of a stealthy approach. Some of the footgear described below gives a modifier to the wearer's Stealth skill when trying to move silently. Items that list neither a penalty nor a bonus have no effect on Stealth.

Boots (TL5). Standard Wellington or "cowboy"-type boots, in either a pull-on or lace-up version. High heels keep the feet from slipping through saddle stirrups. At higher TLs, these are rugged work boots, combat boots, or hiking boots.

Boots, Arctic (TL5). Heavily insulated and waterproof boots. At TL7-8, double price but halve weight. Arctic boots are often worn with crampons (p. 56). -1 to Stealth.

Boots, High (TL5). Bucket boots were popular in the 1700s. These pull-on riding boots extend to the knees or even mid-thigh. Wearers often turn down the high tops, pirate fashion.

Moccasins (TL5). Light, thin leather footwear preferred by hunters, Indians, and other people who need to move quietly. Use the same statistics for any light, functional shoes; e.g., Japanese *tabi*. +1 to Stealth.

Footwear Table

TL	Armor	Location	DR	Cost	Weight	LC	Notes
5	Boots	feet	2*	$80	3	4	[1, 2]
5	Boots, Arctic	feet	2*	$150	6	4	[1, 2]
5	Boots, High	feet	2*	$100	6	4	[1, 2, 3]
5	Moccasins	feet	1*	$40	1	4	[1]
6	Cleats	feet	1*	$50	2	4	[2]
6	Sneakers	feet	1*	$40	2	4	[1]
6	Boots, Steel-Toed	feet	6/2	$100	4	4	[1, 2, 4]
7	Boots, Jungle	feet	3/2	$75	3	4	[1, 2, 5]
7	Boots, Blast	feet	15/2	$350	5	3	[2, 5]
8	Boots, Firefighter	feet	6/3	$250	7	4	[2, 4, 5]
8	Shoes, Climbing	feet	1*	$80	1	4	[1]

Notes:

[1] Concealable *as* or *under* clothing.

[2] Give +1 to kicking damage (p. B271).

[3] With the tops turned up, provide 3/6 protection to the legs; see *Hitting 'Em Where It Hurts* (p. 69).

[4] Split DR: use the first, higher DR when – in the GM's opinion – the boot's steel toe box would protect (e.g., dropping an item on the foot or crushing the toes in heavy machinery) or when an attack on the foot hits the toe (2/6 protection); use the second, lower DR against all other attacks.

[5] Split DR: use the higher DR when an attack strikes foot from *beneath*.

My Sore, Aching Feet!

Those trekking off into danger wearing footwear that hasn't yet been "broken in" must make a HT, Hiking, or HT-based Soldier roll. *Equipment Modifiers* (p. B345) apply for custom-made footwear, which is of good or fine quality. Success means the footwear breaks in quickly, with a minimum of discomfort. Failure results in moderate pain (p. B428) for 2d days. Critical failure leads to terrible pain or even a crippled foot – GM's decision.

Cleats (TL6). Athletic shoes fitted with spikes. They give Terrain Adaptation (Mud and Dirt). -1 to Stealth on tile floors, concrete, bare rock, etc.

Sneakers (TL6). Duck cloth uppers vulcanized to thick rubber soles. Later TLs introduce air-cushioned soles, zippered pockets, and even tiny impact-activated lights. +1 to Stealth.

Boots, Steel-Toed (TL6). Industrial or construction boots, with a box of metal around the toes.

Boots, Jungle (TL7). Boots with steel shanks in the soles for protection against attacks from below (nails, spiked pits, caltrops, etc.).

Boots, Blast (TL7). A pair of clumsy, heavy boots, worn by explosive ordnance disposal (EOD) personnel when clearing minefields. They have ballistic material in the soles to protect against attacks from below. -1 to Stealth.

Boots, Firefighter (TL8). These rubber-soled, waterproof boots are nearly indestructible. They have steel toes, and steel shanks protect the bottom of the feet. -1 to Stealth.

Shoes, Climbing (TL8). Shoes with sticky rubber soles that are soft and pliable enough to allow the wearer to feel the surface beneath his feet. Give +1 to Climbing when scaling a vertical stone wall or other slick surface (see *Climbing,* p. B349). +1 to Stealth.

Gloves

Hockey Glove (TL7). A modern padded sports glove for *one* hand. Gives Ham-Fisted 1 (p. B138) when using that hand for fine work.

Frisk Gloves (TL8). Policemen often wear thin leather gloves with ballistic fiber liners which provide some protection against "sharps": needles and other objects that might stick or cut an officer during a pat-down search.

Sharp-Protective Gloves (TL8). Gloves that protect the hands much as sharp-protective armor (p. 67) protects the limbs.

Headgear

Skullcap (TL5). A thin metal plate designed to be worn under a hat. Skullcaps were relatively common in the civilian market throughout TL5-6. The French army issued such a cap to its soldiers in 1915.

Stock (TL5). A stiff leather collar buckled around the throat to protect against cutlass or saber blows. Many soldiers wore a stock, but the United States Marines were so strongly associated with the black leather stocks they wore until 1872 that Marines are sometimes called "leathernecks" even today.

Cavalry Helmet (TL6). A cuirassier's stainless-steel or nickel-plated dress helmet. Polished to a mirror finish, it has a cloth cover for field use. It's worn with the steel corselet (p. 65).

Early Firefighter's Helmet (TL6). This traditional firehelmet design has a high crown with a shield in front bearing fire-company markings, and a wide brim long enough in the back to keep water and debris off the firefighter's neck and out of his coat.

Hitting 'Em Where It Hurts

The ***Basic Set*** takes an all-or-nothing approach to armor coverage: an armored hit location is completely covered, or nearly so (see *Targeting Chinks in Armor,* p. B400). For extra detail, use the following rules.

A hit location may be covered by one or more pieces of armor which provide only an *n*-in-6 chance of protection. Add *n* if multiple items protect the hit location. Roll 1d whenever such a partially armored location is hit. On a roll equal to or less than *n,* DR protects.

An attacker can attempt to strike around partial armor. This gives a penalty over and above that for hit location: -(*n*-1), but never better than -1. That is, -1 for 1/6 or 2/6, -2 for 3/6, -3 for 4/6, or -4 for 5/6.

Heavy Helmet (TL6). A heavy steel helmet, such as the German *Stahlhelm* ("steel helmet") of WWI. A strap-on brow reinforcement of heavy steel plate is sometimes issued to machine gunners and trench sentries. This addition protects the skull from the *front* (+15 DR, +$10, +5 lbs.).

Leather Helmet (TL6). The famous "Snoopy"-style skullcap worn by aviators, tankers, paratroopers, and even athletes. It has ear flaps and thick padding. Later models have built-in headphones and steel plates, greatly increasing protection (+4 DR, +$50, +2 lbs.).

Gloves Table

TL	Armor	Location	DR	Cost	Weight	LC	Notes
7	Hockey Glove	hand	3	$50	2	4	
8	Frisk Gloves	hands	1*	$50	0.5	4	[1]
8	Sharp-Protective Gloves	hands	3/1*	$30	1	4	[1, 2]

Notes:

[1] Concealable *as* or *under* clothing.

[2] Split DR: use the first, higher DR against *impaling* and *cutting* attacks; use the second, lower DR against *all other damage types.*

Light Helmet (TL6). This "Brodie pattern" helmet is the standard British and American helmet from WWI through WWII. The "tin hat" or "battle bowler" is a shallow helmet with wide brim.

Medium Helmet (TL6). A well-designed steel helmet, such as the M1 "steel pot" worn by American soldiers from 1942 to the mid-1980s. The removable liner can be worn on its own (DR 1, $10, 1 lb.).

Frag Helmet (TL7). A ballistic resin pressed into a helmet shape, like the American PASGT helmet. The visor is worn for riot duty, as protection against rocks and other thrown projectiles.

Hard Hat (TL7). A lightweight aluminum "skull bucket" for construction sites. At TL8, it's made from non-conductive plastic and costs half as much.

Modern Firefighter's Helmet (TL7). Identical in shape to a leather firefighter's helmet, but the shell is made from heat-resistant plastic. It has a visor that can be flipped down to protect the face, and a clamp on the side to mount a small flashlight.

Motorcycle Helmet (TL7). A full-face, energy-absorbing shell designed to protect a motorcyclist's head from impact in a wipeout.

Ballistic Helmet (TL8). An improved ballistic helmet, such as the U.S. Army's MICH (Modular/Integrated Communications Helmet). It has attachment points for night-vision goggles and flashlights. Some include a removable ballistic visor for close-quarters battle.

Football Helmet (TL8). A heavy-duty sports helmet with a full facemask, designed to absorb and dissipate heavy impacts.

Hockey Helmet (TL8). A sports helmet of the sort used by recreational skaters, snowboarders, climbers, and so on. Light assault forces sometimes wear it for protection against falls and general bumps and bruises.

Riot Helmet (TL8). A riot or corrections helmet has a metal cage – much like a football helmet (above) – but adds a full polycarbonate "splatter shield" over the mask to block contact with biological hazards. The design allows the user to wear a gas mask underneath.

Ear Protection

Explosions, firearms, motorcycles, and power tools are loud enough to cause temporary Hearing penalties. All have the potential to inflict Hard of Hearing (p. B138) over time. Shooters use a variety of means to prevent such damage. Tactical teams often wear an earplug in one ear and a radio earbud (see *Headsets and Microphones,* p. 39) in the other. All of these measures grant Protected Hearing (p. B78).

Earmuffs (TL6). Give Protected Hearing and Hard of Hearing while worn. $200, 1 lb. LC4.

Earplugs (TL7). Give Protected Hearing and Hard of Hearing while worn. $1, neg. LC4.

Electronic Earmuffs (TL8). Filter out loud noises electronically but still allow normal conversation. Provide Protected Hearing while worn. $100, 1 lb., XS/100 hrs. LC4.

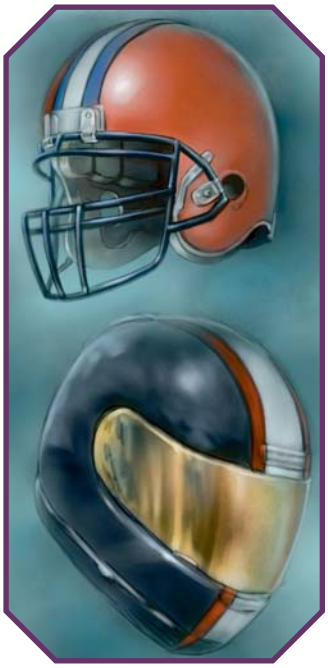
Electronic Earplugs (TL8). As electronic earmuffs (above), but fit completely inside the ear. $1,500, neg., T/400 hrs. LC4.

Eye Protection

Protective goggles and glasses were widely used by cyclists and aviators in WWI, and went on to become standard props for adventurers. Most grant defensive

Headgear Table

TL	Armor	Location	DR	Cost	Weight	LC	Notes
5	Skullcap	skull	3	$50	1	4	[1]
5	Stock	neck	2	$10	0.5	4	
6	Cavalry Helmet	skull	4	$100	3	4	
6	Early Firefighter's Helmet	skull	2	$20	1	4	
6	Heavy Helmet	skull	6	$100	5	4	
6	Leather Helmet	skull	2	$20	1	4	[1]
6	Light Helmet	skull	3	$40	2	4	
6	Medium Helmet	skull	4	$60	3	4	
7	Frag Helmet	skull	5	$125	3	4	
	+ *Visor*	eyes, face	1	+$25	+1.5	4	
7	Hard Hat	skull	4/2	$50	1	4	[2]
7	Modern Firefighter's Helmet	skull	5	$250	2.5	4	
	+ *Visor*	eyes, face	1	+$50	+0.5	4	
7	Motorcycle Helmet	head	6/3	$200	3	4	[2]
	+ *Visor*	eyes, face	1	+$50	+0.5	4	
8	Ballistic Helmet	skull	12	$250	3	3	
	+ *Visor*	eyes, face	10	+$200	+1.4	3	
8	Football Helmet	skull, face	6/3	$150	3	4	[2]
8	Hockey Helmet	skull	2/1	$50	2	4	[2]
8	Riot Helmet	skull, face	6	$200	3	4	
	+ *Visor*	eyes, face	1	+$50	+0.5	4	



Notes:

[1] Concealable *as* or *under* clothing.

[2] Split DR: use the first, higher DR against *crushing* attacks; use the second, lower DR against *all other damage types.*

advantages while worn. All require a Ready maneuver to don or remove.

Goggles

The purpose of goggles is to form a seal around the eyes to keep out damaging dust, smoke, and other particles.

Dive Mask (TL6). A basic swimming or scuba mask grants Nictitating Membrane 1 (p. B71). $25, 1 lb. LC4.

Goggles (TL6). *Glass* goggles, with leather fittings. They give Nictitating Membrane 1 – but hits that penetrate the DR 1 this provides may cause *extra* damage! Some are tinted, and also grant Protected Vision (p. B78) against bright ordinary light (not lasers, etc.). $20, neg. LC4.

Anti-Laser Goggles (TL8). With the growing threat of dazzle lasers, modern military forces began to field anti-laser goggles in the 1990s. These provide both Protected Vision and Nictitating Membrane 4. $200, neg. LC4.

Tactical Goggles (TL8). Nonfogging ballistic goggles with a tough polycarbonate lens. They grant Nictitating Membrane 5. $100, neg. LC4.

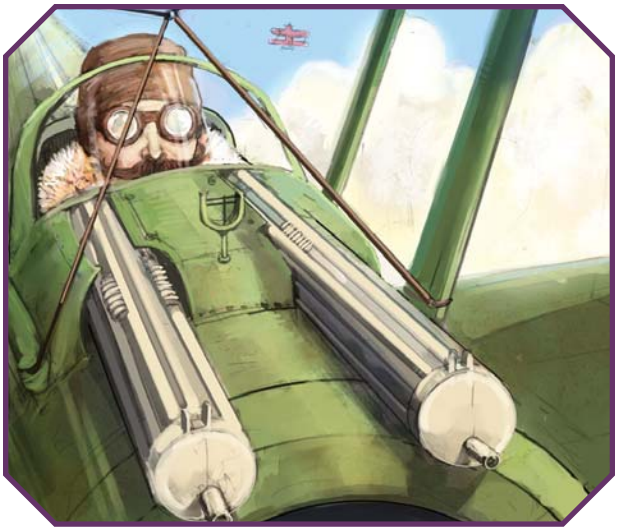
Glasses

Unlike goggles, glasses protect against impacts and splashes, but *not* dust, gas, or submersion in liquids.

Sunglasses (TL5). Sunglasses became commercially available at TL5. Doctors prescribed tinted lenses for "weak eyes," claiming that certain childhood diseases made their patients sensitive to sunlight. Sunglasses protect the eyes with DR 1. $50, neg. LC4.

Sunglasses (TL6). Ray-Bans were issued to aviators in the 1930s to protect against high-altitude glare and instrument-panel reflections. A trendy mirrored coating becomes available circa 1950 (TL7). Polarized sunglasses give Protected Vision against bright ordinary light and DR 1 over the eyes. $10, neg. LC4.

Ballistic Sunglasses (TL8). Modern battlefield sunglasses, designed to protect against a shotgun blast. They give Protected Vision against bright ordinary light and DR 4 for the eyes. $35, neg. LC4.



Dirty Tech: Homemade Armor

Layers of paper (newspapers, magazines, etc.) and duct tape can be fashioned into a thick vest capable of providing some protection against knives, shotgun pellets, and shell fragments. It won't tolerate water, though, and will come apart in damp weather. Constructing it requires an Armoury (Body Armor) roll at +5 – an IQ roll, if working at default – and 30 minutes' work. Gives the torso DR 3. 18 lbs.

A pair of heavy snips or bolt cutters can turn a plastic bucket or barrel into a quick-and-dirty *lorica segmentata* (p. B283). This requires an Armoury (Body Armor) roll at +3 and 3 hours' work. Gives the torso DR 3. 11 lbs.

In a post-apocalyptic setting, those with the Armoury (Body Armor) skill and suitable tools can recycle old road signs and car bodies into *real* shields and armor.

Miscellaneous Bits and Pieces

These items protect very specific body parts from certain types of injury.

Cup (TL7). A plastic guard that gives the groin DR 2 vs. crushing (DR 1 vs. other damage), only from the *front*. Also grants +2 to knockdown rolls for groin hits. $20, neg. LC4.

Mouthguard (TL7). A form-fitted plastic mouthpiece worn to protect the jaw and teeth. Gives +1 to knockdown rolls for face hits, but makes speech difficult (treat as Disturbing Voice, p. B132). $20, neg. LC4.

Knee or Elbow Pads (TL8). Modern pads provide DR 3 for arm or leg joints when crawling, kneeling, or falling on hard surfaces (GM's decision), or when the knee or elbow is struck in combat (2/6 protection for that limb). Per pair: $20, 0.5 lb. LC4.

SHIELDS

Shields were used in WWI trench warfare, and are still found in the hands of riot police and SWAT teams on the mean streets of the world's metropolises. With the exception of riot officers, modern shield-bearers seldom use the Shield skill; they carry a shield strictly as *cover* (see p. B407). To interpret the table, see *Shield Statistics* (p. B287).

Bulletproof Shield (TL6). A heavy steel shield used by some military and police throughout the first half of the 20th century. It may have firing ports, allowing the shield-bearer to use the shield for cover *and* as a rifle brace while prone.

Riot Shield (TL7). A simple, medium-sized polycarbonate shield – often with "POLICE" stenciled across the front.

Entry Shield (TL8). A heavy shield deployed by a SWAT team when entering a building. It's made to withstand gunfire, and uses materials similar to trauma plates (p. 67). Some models have mounts for lights or video displays on the front, or even steps that let the shield function as a stepladder for scaling walls.

Shield Table

TL	Shield	DB	Cost	Weight	DR/HP	LC
SHIELD (DX-4, or other Shield at -2)						
6	Bulletproof Shield	2	$300	30	10/80	4
7	Riot Shield	2	$60	7.5	7/40	4
8	Medium Entry Shield	2	$1,200	17	12/40	4
8	Large Entry Shield	3	$1,400	22	12/60	4

Portable Cover

Too heavy to be used as shields, these portable devices provide useful cover from specialized threats.

Explosives Blanket (TL7). A 4'×6' piece of flexible ballistic armor, used to contain an explosion if a bomb can't be removed. Subtract its DR from the bomb's damage roll. It's sometimes used as portable cover for multiple SWAT officers. DR 25. $1,000, 45 lbs. LC4.

Radiation Blanket (TL8). Identical to the explosives blanket (above), but also offers protection against radiation-scattering "dirty bombs." It provides PF 3 (see *Radiation Protection,* p. B436) to those exposed. $2,000, 90 lbs. LC4.

Environmental Protection

At TL5, technology greatly enhances man's ability to operate in and explore deadly environments – especially underwater. At TL6-8, it also gives him towering infernos, speeding vehicles, poison gas, and biological weapons, spurring him to invent defenses against *those* dangers as well.

Air Masks (TL5)

An air mask consists of a facemask or a mouthpiece equipped with a filter or a regulator. All varieties must be fitted correctly in order to form an airtight seal. Early rubber masks are shaved to fit with a knife and then sanded smooth. Modern ones come in specific sizes.

At TL5-7, an air mask muffles the user's voice; a listener must make a Hearing roll to understand him. This *does* affect radio communication. At TL8, masks often have built-in voice amplifiers and radio adapters that negate the need for this roll.

All air masks take three seconds to put on, one second to remove.

Gas Masks (TL5)

A gas mask uses "negative pressure": the wearer sucks in clean air through the filter medium. Weight includes a replaceable filter ($25, 0.5 lb.).

Gas Mask (TL5). A heavy leather hood fitted with glass lenses and a primitive smoke or dust filter.

Gas Mask (TL6). Many models have a separate belt- or chest-mounted filter connected to the mask by a hose. Severing the vulnerable hose (-2 to hit) exposes the wearer to the environment.

Gas Mask (TL7). This mask includes fittings for drinking from a canteen or a water pack without unmasking.

Gas Mask (TL8). In addition to canteen fittings, modern masks include a voice amplifier and an adapter for using a radio while masked. Some have tinted lenses, providing Protected Vision against bright ordinary light.

SCBA Masks (TL7)

Self-contained breathing apparatus (SCBA) uses "positive pressure": it expels air from a tank, keeping contaminants from entering the mask. Tests have shown that firefighters can breathe through SCBA even when floating face-down in water (beyond this, a malfunction is likely). The pioneers of SCBA were WWII firefighters. The SCBA mask has since become standard gear for fire and rescue personnel, who typically use it with a small air tank (p. 74).

SCBA Mask (TL7). A basic mask and regulator.

SCBA Mask (TL8). A mask with a spare "buddy hose" to share with another air mask, a HUD-style air gauge, and an alarm that sounds five minutes before the air tank expires. It also has a voice amplifier and an adapter for using a radio while masked.

Gas Mask Table

TL	Armor	Location	DR	Cost	Weight	LC	Notes
5	Gas Mask	eyes, face	2	$100	8	4	[1, 2]
6	Gas Mask	eyes, face	2	$100	4	4	[1, 3]
7	Gas Mask	eyes, face	2	$200	3.5	4	[1, 3]
8	Gas Mask	eyes, face	2	$250	2	4	[1, 3]

Notes:

[1] Gives Filter Lungs, Immunity to Eye and Nose Irritants, and No Sense of Smell/Taste.

[2] Gives Tunnel Vision (p. B151).

[3] Gives No Peripheral Vision (p. B151).

SCBA Mask Table

TL	Armor	Location	DR	Cost	Weight	LC	Notes
7	SCBA Mask	eyes, face	2	$200	5	4	[1]
8	SCBA Mask	eyes, face	2	$400	4	4	[1]

Notes:

[1] Gives Doesn't Breathe (while the air tank holds out), Immunity to Eye and Nose Irritants, No Peripheral Vision (p. B151), and No Sense of Smell/Taste.

Scuba Mask Table

TL	Armor	Location	DR	Cost	Weight	LC	Notes
7	Scuba Mask	eyes, face	2	$500	4	4	[1]
7	FFM	eyes, face	2	$1,000	6	4	[1]
8	Scuba Mask	eyes, face	2	$400	4	4	[1]
8	FFM	eyes, face	2	$1,000	2	4	[1]

Notes:

[1] Gives Doesn't Breathe (while the air tank holds out), Immunity to Eye and Nose Irritants, No Peripheral Vision (p. B151), and No Sense of Smell/Taste.

Scuba Masks (TL7)

Reliable self-contained *underwater* breathing apparatus (formerly abbreviated SCUBA, but "scuba" today) is another WWII-era innovation. The standard "mask" is actually a tank-mounted regulator and mouthpiece with a separate diving mask (p. 71). This is a typical "open-circuit" system; bubbles are detectable on the surface.

Scuba Mask (TL7). The traditional scuba mask has a demand-only regulator, meaning it only provides air when the diver sucks on the mouthpiece.

Full-Face Mask (TL7). The "FFM" completely covers the face in a positive-pressure environment, allowing the diver to use an underwater communicator (p. 40). It is more comfortable for lengthy dives, is less likely to be knocked off, and provides air even if the diver is unconscious.

Scuba Mask (TL8). The TL8 mask includes a spare mouthpiece for sharing air in an emergency – and possibly a HUD-style air gauge that connects to wireless equipment such as a dive computer or a wrist-mounted depth gauge.

Full-Face Mask (TL8). A lightweight FFM with all the bells and whistles of a TL8 scuba mask (above).

Hard-Hat Diving Gear (TL5)

In the 1830s, Augustus Siebe perfected "closed" diving dress: a helmet sealed to a waterproof suit and fitted with controlled intake and outlet valves for air. This is still basic equipment for the modern "hard-hat" diver, who's tied to the surface by air lines. Hard-hat gear makes diving about as safe as being underwater can be; the dangers aren't so much inherent in the hardware as in the environment. Most diving jobs are construction, salvage, and rescue jobs that would be difficult and dangerous even on land. When performing a *risky* activity underwater in diving dress, roll against Diving Suit (p. B192). Most failures mean a job-specific hazard such as a punctured hose or suit, a fouled line, or a broken helmet.

Hard-hat diving isn't a solo activity. It requires a trained crew of handlers on the surface. Before the 1940s, most air pumps were operated manually by two or more pumpers. In addition, at least one line-tender is needed to keep the air hose and ropes from fouling. Paranoid adventurers should be encouraged to dwell on the thought of treachery topside!

Closed-Dress Rig (TL5). A brass helmet with portholes, a rubberized canvas suit, and lead-soled shoes. Air is delivered from the surface by a hand-powered compressor ($1,000, 300 lbs.), via 200' of hose on a reel ($500, 25 lbs.). At TL6, the rig includes an intercom, and no manual compressor is needed, as most ships have an air compressor aboard. $4,000, 500 lbs. LC4.

Diving Suit Table

TL	Armor	Location	DR	Cost	Weight	LC	Notes
5	Closed-Dress Suit	full suit	6/2	$2,500	175	4	[1]
8	Hard-Hat Suit	full suit	6/2	$9,000	95	4	[1]

Notes:

[1] Suit only. Use DR 6 for the *head,* DR 2 for *everything else.* Gives Doesn't Breathe (while the pump is working), Immunity to Eye and Nose Irritants, No Sense of Smell/Taste, and Tunnel Vision (p. B151).

Hard-Hat Rig (TL8). A modern salvage suit with weights and helmet, plus a reel with 200' of hose ($1,000, 25 lbs.). $10,000, 120 lbs. LC4.

Air Tanks (TL6)

Air tanks connect to an air mask (pp. 72-73). Those described below include valves, fittings, carrying harness, etc. Tanks may be filled with a variety of compressed breathing gases – including ordinary air, pure oxygen, and oxygen-helium-nitrogen "trimix" – but for simplicity's sake, these rules ignore the differences and assume that skilled users have the right mix.

Tank duration supposes a mostly inactive adult; assume that a tank lasts twice as long for a child under 12 years of age. Stress and heavy exertion greatly reduce textbook duration; a rookie firefighter uses up his air far more quickly than does an old hand. Subtract a minute from duration for each FP expended and for each *failed* Fright Check.

When using these tanks for scuba diving, divide duration by the local pressure. Divide by 2 at 33' depth, by 3 at 66', by 4 at 100', and so on. See *Pressure* (p. B435) for details.

Small Tank: Duration is 12 minutes (TL6), 22 minutes (TL7), or 45 minutes (TL8). $200, 15 lbs. LC4.

Medium Tank: Duration is 22 minutes (TL6), 45 minutes (TL7), or 90 minutes (TL8). $400, 25 lbs. LC4.

Large Tank: Duration is 45 minutes (TL6), 90 minutes (TL7), or 3 hours (TL8). $600, 35 lbs. LC4.

Climate-Controlled Clothing (TL6)

Heated clothing appears at TL6; true personal climate control, at TL7. Simple systems rely on phase changes, heat exchangers, or evaporative cooling to keep the wearer's body temperature at a safe level. These must be "recharged" after a few hours – often by dunking them in either warm or cold water. Complex systems use a capillary network in an undergarment to circulate water or coolant. These require electricity but work for as long as the batteries hold out.

The systems below extend one or both ends of the normal human comfort zone of 35°F to 90°F (see *Temperature Tolerance,* p. B93). This alters the temperatures at which *Cold* (p. B430) and/or *Heat* (p. B434) apply. Systems that extend the hot end of the zone also negate extra FP costs in hot weather (see *Fatigue Costs,* p. B426).

Some suits under *Environment Suits* (see below) include climate control. The suit statistics include the cost and weight of the climate-control system, and the system runs off the suit's power supply.

Heated Clothing (TL6). An electrically heated bodysuit adds 60° to the *cold* end of the comfort zone. Without power, it counts as winter clothing. It runs off external power indefinitely – or batteries, at TL8. $550, 6 lbs., M/8 hrs. LC4.

Climate-Control System (TL7). Adds 60° to *both* ends of the comfort zone. It contains 3 quarts of water, a quart of which can be used as drinking water without reducing effectiveness. $2,500, 15 lbs., 4×S/8 hrs. LC4.

Cooling System (TL8). A phase-change or evaporative cooling vest that adds 30° to the *hot* end of the comfort zone for 4 hours. "Recharged" by soaking it in ice-cold water for 15 minutes. $200, 5 lbs. LC4.

Environment Suits (TL7)

These suits protect against dangerous atmospheres and other threats. Safe use of much of this equipment requires a specialized Environment Suit skill (p. B192).

Anti-G Suit (TL7). This outfit helps a pilot tolerate the "G-forces" of high acceleration and rapid maneuvers. It typically covers the legs and lower abdomen, and uses air or water to limit blood flow away from the brain. This provides +3 to HT rolls to resist high accelerations (p. B434). It's often worn with a fireproof suit (below).

Biohazard Suit (TL7). A bulky, hermetically sealed suit worn for protection from chemical spills and plagues. It cannot pass for clothing. It's worn with an air mask or an SCBA (pp. 72-73), which fits completely under the suit. It's incredibly hot – *triple* FP losses while suited-up. At TL8, advanced versions (×2 cost) have a special lining that effectively blocks low-level radiation, providing PF 2.5 against gamma or beta radiation; see *Radiation Protection* (p. B436). It uses the NBC Suit skill.

Clean Suit (TL7). A *disposable* paper suit (with booties, gloves, and hood) used in a "clean room," or during forensic evidence collection or surgical operations. Investigators commonly wear a paper facemask – or optionally, an air

mask (pp. 72-73) – to avoid inhaling dried blood or fecal matter. It uses the NBC Suit skill.

Dry Suit (TL7). A baggy, waterproof full-body suit that keeps the wearer dry while diving. It resists thermal shock effects in cold water (see *Cold,* p. B430), but the diver must wear proper clothing beneath it to protect against the cold. A dry suit is loose-fitting enough to accommodate a stylish tuxedo underneath . . .

Fireproof Suit (TL7). A fire-resistant jumpsuit worn by race-car drivers, pilots, forest firefighters, and SWAT men for short-term flame protection.

NBC Suit (TL7). A *disposable* quilted suit with a charcoal lining that protects against radioactive fallout and poisonous gases. It quickly loses its seal in a wet environment, and must be stored in an airtight container. After 72 hours at most, it's no longer reliable protection. It uses the NBC Suit skill.

Space Suit (TL7). The "intravehicular" space suit of the Apollo missions – that is, the suit used *inside* the spacecraft. It consists of several layers of neoprene and nylon, along with a pressure bladder, biomedical attachments, a tight-fitting cap equipped with headphones and mike, and a clear polycarbonate helmet. It uses the Vacc Suit skill.

Biomedical Sensors (TL7)

This rig tracks the wearer's blood pressure, cardiopulmonary activity, oxygen saturation, and other vital functions. It can be remotely monitored over a communications system, and gives medics a +1 (quality) bonus to Diagnosis. Added to armor or suit: $2,000, 2 lbs., 2×XS/24 hrs. LC4.

Some suits under *Environment Suits* (pp. 74-76) include this system. Its cost, weight, and power requirement are included in the suit statistics.

Space Suit, EVA (TL7). This is the Apollo "extravehicular activity" (EVA) space suit. It's essentially the intravehicular suit (above) with several additional features, including a liquid-cooled climate-control system (p. 74), an outer protective shell, a life-support backpack (duration is 7 hours), and a short-range radio. It uses the Vacc Suit skill.

Turnout Gear (TL7). A modern firefighter's outfit: coat, trousers, gloves, and hood (for other gear, see *Footwear,* pp. 68-69, *Headgear,* pp. 69-70, and *Air Masks,* pp. 72-73). The suit absorbs water if it gets wet (up to twice normal weight!), which provides an extra DR 5 versus burning damage. If any burning damage penetrates this DR, though, double it – the water turns to steam inside the suit, and the firefighter can't feel the heat until it's too late!

Environment Suits Table

TL	Armor	Location	DR	Cost	Weight	LC	Notes
7	Anti-G Suit	full suit	0	$5,000	6	4	
7	Biohazard Suit	full suit	1*	$500	8	4	[1, 2]
7	Clean Suit	full suit	0	$100	1	4	[3]
7	Dry Suit	full suit	1*	$1,000	6	4	
7	Fireproof Suit	full suit	4/1*	$200	4	4	[4, 5]
7	NBC Suit	full suit	1*	$150	3.5	4	[1, 2, 5]
7	Space Suit	full suit	2	$2,000,000	80	4	[2, 6]
	+ *Space Helmet*	head	2	+$5,000	+5	4	[7]
7	Space Suit, EVA	full suit	2	$2,000,000	180	4	[2, 8]
	+ *Space Helmet*	head	3	+$25,000	+10	4	[9]
7	Turnout Gear	full suit	5/2*	$1,500	12	4	[4]
7	Wetsuit	full suit	1*	$200	3	4	
8	Bomb Disposal Suit	full suit	20/5*	$10,000	65	3	[10]
	+ *Visor*	eyes, face	10	+$200	+3	3	

Notes:

[1] Uses NBC Suit skill. Provides the Sealed advantage if worn with an air mask (pp. 72-73).

[2] Suit's DR applies only against *burning* or *corrosion* damage.

[3] Gives +4 HT when dealing with disease-ridden victims; see *Contagion* (p. B443).

[4] Use the higher DR against *burning* damage only.

[5] Concealable *as* or *under* clothing.

[6] Uses Vacc Suit skill. Biomedical sensors (see above) allow remote monitoring of vital signs, giving +1 to Diagnosis skill when examining the wearer. Worn with its helmet and connected to an air supply, the suit gives Doesn't Breathe, Protected Smell, Sealed, and Vacuum Support.

[7] Provides Filter Lungs, Protected Hearing, Protected Smell, and Protected Vision – and Radio, while the mike and headset are plugged in. Also gives the No Peripheral Vision disadvantage (p. B151).

[8] As note [6], with the addition of a climate-control system (p. 74) and a life-support pack that gives Doesn't Breathe for 7 hours when the helmet is worn.

[9] As note [7], but the Radio is self-contained.

[10] Split DR: Use the first, higher DR against attacks from the *front;* use the second, lower DR for attacks from *all other directions.* This is *torso* DR; head is DR 7, limbs are DR 5.

Rebreather Table

TL	Armor	Location	DR	Cost	Weight	LC	Notes
7	Early Rebreather	eyes, face	2	$2,000	30	4	[1]
7	Rebreather	eyes, face	2	$3,500	30	4	[1]
8	Advanced Rebreather	eyes, face	2	$7,000	45	4	[1]

Notes:

[1] Gives Doesn't Breathe (while the air tank holds out), Immunity to Eye and Nose Irritants, No Peripheral Vision (p. B151), and No Sense of Smell/Taste.

Wetsuit (TL7). A neoprene or similar suit, it counts as winter clothing in cold water and provides a small amount of protection.

Bomb Disposal Suit (TL8). A modern ballistic suit, worn by bomb-disposal technicians. It fully encapsulates the wearer in bulletproof material – except for the hands, which are totally unprotected. This allows the bomb tech to work without being hampered by gloves. Some are fitted with a climate-control system (p. 74).

Rebreathers (TL7)

Whereas conventional scuba gear releases exhaled gases as a stream of bubbles, a rebreather captures these gases in a "counterlung" or breathing bag, where a chemical absorbent removes the CO^2, and then mixes and circulates them with gases from air tanks. Such a "closed-circuit" system produces no telltale bubbles. Shallow-water rebreathers use pure oxygen, and are *dangerous* below 30' (see *The Bends,* p. B435). Advanced deep-diving rebreathers use a mixed-gas system to avoid problems with the bends, allowing deeper dives.

Rebreathers are comparatively complicated. The GM may opt to treat their use as a specialty of the Scuba skill. Scuba (Closed-Circuit) defaults to normal Scuba at -4; the default in the other direction is only -2.

Early Rebreather (TL7). A WWII-era oxygen scrubber – complicated, finicky, and poorly understood. Duration is 1.5 hours.

Rebreather (TL7). A shallow-water rebreather. Duration is 4 hours.

Advanced Rebreather (TL8). A modern mixed-gas rebreather. Duration is 4 hours.

Stealth and Camouflage

There's more to staying safe than thick armor and fireproof underwear. Often, the best defense is not to be detected!

Camouflage

Camouflage – from the French *camoufler,* meaning "to disguise" – is a smoke-and-mirrors operation. It's also highly technical, culminating in digitally generated patterns on infrared-suppressing clothing at TL8. To spot a camouflaged person, an observer must *win* a Quick Contest of Vision or Observation skill (p. B211) vs. his target's Camouflage skill (p. B183). For hidden equipment, roll the same Contest but use the Camouflage skill of whoever deployed the camouflage.

Camouflage Clothing (TL6)

Camouflage is often a tradeoff. A pattern may be excellent at close range but ineffective at long range. It may blend into one type of terrain but draw unwanted attention in another. Historically, armies and intelligence services have spent millions of dollars to find the right pattern for all-around use. Commercially available patterns sold to hunters are often more effective than military ones in highly specific environments, but sacrifice *general* utility.

Simple Camouflage (TL6). The most common variety of camouflage is khaki, *feldgrau,* olive drab, or something similar. It gives +1 (quality) to Camouflage skill. Clothing can have such a color or pattern at no extra cost. LC4.

Basic Camouflage (TL7). A pattern appropriate to the terrain gives +2 (quality) to Camouflage in *that* terrain – but -1 in *other* terrain and -2 in highly contrasting terrain (e.g., arctic camouflage in the jungle). Camouflage clothing at TL7+ incorporates dyes that mask or absorb light in the near-infrared wavelengths, too, providing +1 to Camouflage vs. observers relying on technological Night Vision or Infravision. Most recent military camouflage falls into this category: the USMC's digital MARPAT, the U.S. Army's woodland pattern, Vietnam-era "tigerstripe" for jungle warfare, etc. Costs 100% of clothing cost. LC4.

Advanced Camouflage (TL8). The best camouflage is highly optimized for one extremely specific terrain – "snowy deciduous forest," "autumn hardwood forest," "marshy bottomland," etc. – and may even include 3D components such as die-cut texturing. It gives +3 (quality) to Camouflage in the intended terrain but -2 almost everywhere else. Examples include the products of top commercial manufacturers; e.g., Realtree, Predator, and Mossy Oak. Costs 200% of clothing cost. LC4.

Reversible Camouflage (TL8). Two different patterns – or one pattern and one normal color – can be printed on opposite sides of clothing, allowing a hunter or a soldier to switch patterns as he moves between terrain types. To find the price, total the additional cost; e.g., two advanced patterns add 400% to clothing cost. LC4.

Camouflage Net (TL6)

A net covered with real or faux foliage. It works like any camouflage pattern, providing a bonus to the Camouflage skill in the right terrain. One net covers about 25 square yards. A simple camouflage net costs $20; more advanced designs have their usual effect on cost. 8 lbs. LC4.

Ghillie Suit (TL6)

This is a shaggy camouflage suit designed to break up the human outline. Users often attach bits of local foliage. Under ideal circumstances – in particular, when there's plenty of vegetation to lurk in – it can make the wearer nearly invisible.

The basic suit gives +3 (quality) to Camouflage if it's similar to the terrain in which it's being used (equivalent to advanced camouflage, see above). Veteran hunters, snipers, and scouts normally customize their suits for further effectiveness; this requires a Camouflage roll. Increase the suit's bonus by the margin of success, to a maximum *total* bonus of +8. If a team is working together to modify ghillie suits, the person with the best Camouflage skill may roll once for everyone. Regardless of quality, a ghillie suit gives -1 to Camouflage rolls in non-matching terrain and -2 in highly contrasting terrain.

A ghillie suit is hot and heavy. Treat it as an overcoat for the purposes of *Fatigue Costs* (p. B426). $500, 12 lbs. LC4.

Let every soldier hew him down a bough
And bear't before him; thereby shall we shadow
The numbers of our host and make discovery
Err in report of us.
– Malcolm, ***Macbeth***

STEALTH

Systems that suppress the user's heat or scent "signature" are also available. They can be used alone or with camouflage.

Infrared-Suppressing Poncho (TL8)

A heavy fabric treated with dyes that block infrared (IR), with preformed slots to allow heat to escape. It gives +2 (quality) to Camouflage vs. thermographs and other Infravision. A poncho in a simple camouflage pattern (p. 76) is $500, 6 lbs. LC4.

A ghillie suit (see left) can have IR-suppressing technology built in for an extra $500 without increasing weight.

IR Camouflage Net (TL8)

This is a bigger version of the IR-suppressing poncho (above), plus a system of support poles. One net covers about 25 square yards. A net in a simple camouflage pattern (p. 76) is $800, 100 lbs. LC4.

Scent Masking (TL8)

This clothing treatment works like a sealed chemical-protection suit in reverse: instead of keeping chemicals out, it prevents chemicals from leaving. The result is -4 to all Tracking attempts to follow the wearer wholly or partly by scent. Scent-masking technology is common on commercial hunter's outfits and an option for most other clothing. Costs 200% of clothing cost. LC4.

Chapter Five
Weaponry

Airk gently squeezed the rifle's trigger and felt the weapon slam into his shoulder. Through the thermographic sight, he saw the white-hot splatter 500 yards away.

"Tango two is down," he whispered into the throat mike.

"Roger that," Locke whispered back as he peeked around the side of a snow-covered wood pile. Rising into a combat crouch, he eased forward, Tommy gun tucked in tight and pointed straight out. His head scanned left and right as he approached the door to the Centrum outpost.

To his left, Nat crept around the corner, covering the side door with a hand-grenade booby trap and his old lever-action.

Locke inhaled and exhaled slowly a couple of times, and then reached for the doorknob . . .

In terms of sheer diversity, the TL5-8 armory puts to shame the offerings of all previous eras. What follows is a guide to help adventurers recognize, choose, and use all manner of armaments – from knives through small arms to artillery.

Firearms

The benefits and curses of technology are manifold, but one invention stands out: the gun. This is as true in role-playing as it is in history. As the adventurers plan their actions, one of their first questions is likely to be, "What guns can we have?"

Firearms ignite a chemical charge whose expanding gases directly or indirectly impart motion to a projectile or projectiles of some variety (see *Ammunition and Warheads,* pp. 161-177). Guns come in widely different layouts and patterns – from tiny holdout pistols to huge vehicular weapons. They first appear at TL3, in the form of cumbersome, unreliable smoothbores.

At TL5, rifled barrels begin to supersede smoothbore ones in most applications. These impart spin to the projectile, making it more accurate. As well, older lock types are replaced by first the flintlock action, then the caplock action, and finally the self-contained cartridge – progressively improving reloading times, reliability, accuracy, and power. Successful *repeating* firearms appear at TL5, too, offering several shots instead of just one.

The most important invention at TL6 is smokeless propellant, which increases power and reliability. It also does away with the huge smoke clouds typical of TL5 battlefields. Self-loading and full-automatic actions are invented and perfected, and semiautomatic weapons and machine guns soon become widely available.

At TL7, firearms become lighter and more reliable. The introduction of shaped-charge munitions to defeat even the thickest armor – and the means to launch them – makes man-portable weapons once again dangerous to armored fighting vehicles.

The trend toward light, reliable weaponry continues at TL8. The most important changes occur in the fields of ammunition and targeting equipment, however. Night-vision devices are more effective than ever, and targeting lasers see wide-scale use.

Firearm Descriptions and Statistics

High-Tech describes specific historical firearms – not generic ones like those on pp. B278-281. These are suitable "as is" for historical and pseudo-historical campaigns. In alternate-worlds games, simply change the names and/or designations.

Examples: The .455 Magnum Amory A-81 pistol from Dixie-1 (see ***GURPS Infinite Worlds*** and ***GURPS Alternate Earths***) can use the stats of the IMI Desert Eagle (p. 102). The Atchisson Type 4 flechette gun from ***GURPS Autoduel*** can be represented by the Daewoo USAS-12 shotgun (p. 107) using MF ammo (p. 174).

The heading above each weapon description includes *make, model, caliber, country of origin,* and *period of manufacture.* It always refers to a *specific* version of a certain weapon. The same is true of the corresponding statistics in the relevant weapon table. In many cases, the notes under the heading discuss different models, variants, predecessors, and copies. Except as indicated, these use the same game statistics as the version in the table.

The notation and abbreviations used in this section obey *Weapon Statistics* (pp. B268-271), with these additions:

RoF: Firearms capable of firing high-cyclic controlled bursts (p. 83) have a number sign (#) after RoF.

Shots: Weapons that can load an additional round directly into the chamber (p. 88) have a "+1" appended to Shots.

Bulk: Weapons with folding or retracting stocks (p. 160) have an asterisk (*) next to Bulk. With stock folded, Bulk improves a step (e.g., from -4 to -3).

Rcl: Shotguns have two Rcl figures. Use the first when firing shot, the second when firing slugs or other single projectiles.

Cost: Weapons with detachable magazines (or other removable feed devices) have two costs separated by a slash. The first is the price of an unloaded weapon with one empty magazine. The second is the price of a spare empty magazine.

Firearm Quality

Improvements to firearm quality typically affect either accuracy or reliability. The two options *can* be combined. It's also possible to add *Styling* (p. 10), alone or with other improvements, to create "presentation" weapons. These rules expand on the standard examples on p. B280 (which are both "accurate" *and* "reliable").

Fine (Accurate). The shooter's quest for accuracy commonly lands guns on the gunsmith's bench. By improving the fit of individual parts and installing expensive precision-manufactured components, set triggers, custom-made target grips, etc., a gunsmith can improve quality to fine (accurate). This only benefits weapons with a base Acc of at least 2, and gives +1 Acc. The necessary modifications require an Armoury (Small Arms) roll and five hours' work. Cost is 75% of the gun's cost.

Dirty Tech: Full-Auto Conversions

A gunsmith can convert most semiautomatic weapons to full-automatic or selective-fire. The necessary work may be trivial or extremely involved, depending on the firearm. Some guns require only the modification of a few parts, others need *new* parts, and the most complicated demand extensive alterations to the entire mechanism.

For example, converting a Winchester M1 carbine (p. 113) or certain open-bolt pistols like the original semiautomatic TEC-9 (p. 101) is a *favorable* task, with a +1 difficulty modifier (see p. B345). Converting a Colt AR-15 (p. 117) is an *average* task, with no modifier. Converting a pistol such as a Walther PPK (p. 99) or a Colt Government (pp. 98-99) to a selective-fire machine pistol is an *unfavorable* task: -1.

With suitable parts and tools, conversion requires an Armoury (Small Arms) roll and 10 minutes' work for a favorable task, 12 hours' work for an average task, and two days' work for an unfavorable task.

Very Fine (Accurate). If the weapon has a base Acc of at least 4, further work can improve quality to very fine (accurate). This grants +2 Acc. This is very rare, and typically confined to the best target rifles available! The modifications require an Armoury (Small Arms) roll and 25 hours' work. Cost is five times that of basic accurizing; that is, 375% of the gun's cost.

*Fine (Reliable).** By polishing and re-angling the feed ramp in self-loading weapons, installing new springs, custom-fitting all components, etc., a gunsmith can improve quality to fine (reliable). This increases the malfunction number (p. B407) by a step; e.g., from 16 to 17. Improving a weapon with Malf. 17 leaves Malf. at 17 – but roll again whenever a malfunction would occur. Unless this roll *also* indicates a malfunction, no malfunction occurs. The modifications require an Armoury (Small Arms) roll and two hours' work. Cost is 25% of the gun's cost.

*Very Fine (Reliable).** Further work can improve Malf. by two steps. This is exceedingly rare except on the best target and sporting weapons available. The modifications require an Armoury (Small Arms) roll and 10 hours' work. Cost is five times that of increasing reliability to fine; that is, 125% of the gun's cost.

* Full-automatic weapons can't be *improved* to fine or very fine (reliable), but some *start out* more reliable than usual, as noted on the weapon tables.

How to Treat Your Gun

Like all tools, firearms have to be treated well in order to remain serviceable. And like all weapons, guns must be handled carefully in order to avoid accidental injuries to the wielder or to bystanders. Below are several *optional* rules for such matters, intended for gaming groups that enjoy maximum realism in their games.

Handling

In a realistic campaign, a firearm should always be considered loaded. Those who run around with a finger on the trigger, try to climb a ladder with a pistol in hand, drop a loaded weapon as a "free action," and so on are *inviting* accidental discharge. Whenever somebody with a gun in hand attempts to do anything but shoot – e.g., climb, drive, or ride a horse – the GM may rule that a failed DX or skill roll indicates an accidental discharge, a malfunction (p. B407), or even a broken firearm . . . especially if the gunman suffers from Unluckiness or Cursed!

At TL6+, a firearm usually has a manual safety to prevent it from discharging accidentally (see also *"Unsafe" Revolvers,* p. 93). When using a familiar weapon (see *Familiarity,* p. B169), engaging or disengaging such a safety is a free action at either the beginning or the end of a turn – but not both. Those operating at their default from DX or another Guns specialty, or who are otherwise unfamiliar with the weapon, must take a Ready maneuver to engage or disengage the safety. Cruel GMs may require an IQ roll to *remember* to disengage the safety under stressful circumstances!

If the weapon lacks a positive safety, though – or has a reputation as "unsafe" or as liable to start firing if dropped – then an accidental discharge is particularly likely. It may hit the holder of the gun or somebody else (see *Hitting the Wrong Target,* p. B389), or at least draw attention at a possibly inconvenient time. Note that a weapon may also discharge accidentally if stowed improperly; e.g., tucked into pants (unless you have the Pants-Positive Safety perk, p. 249) or a coat pocket. This can trip the safety (off *or* on), or even snag the hammer and fire the weapon.

Instead of accidentally discharging, a weapon with a detachable magazine may accidentally eject its magazine. This is a surprisingly common mishap, especially with weapons that have an unprotected magazine release (e.g., the Enfield L85A1, p. 118).

Cleaning and Maintenance

Firearms need proper care, including cleaning and lubrication. Military firearms are normally issued with a cleaning kit (p. 160); many store an oil bottle and a basic cleaning kit in the stock or pistol grip. The rules under *Maintenance* (p. B485) definitely apply. For small arms and their feed devices, each maintenance check calls for an IQ-based Guns, Armoury (Small Arms), or Soldier roll. For heavy weapons, roll against IQ-based Gunner, Armoury (Heavy Weapons), or Soldier.

Some weapons are more tolerant of neglected maintenance than others, though, and need less-frequent maintenance checks (e.g., the AK-47, p. 114). Generally, the simpler the design, the less maintenance it requires. For instance, a double-barreled shotgun requires less attention than a machine gun.

Harsh environments complicate maintenance. In the desert, many lubricants attract fine dust that can clog the action. This problem can be solved by paying more attention to cleaning; *closed* holsters and scabbards (pp. 153-154) are also advisable. Extreme heat and cold, vacuum, and some exotic (but non-corrosive) atmospheres require special lubricants that won't freeze, evaporate, or otherwise be lost or destroyed. Weapons not specifically designed to cope with a particular hostile environment suffer a temporary -1 or worse to Malf.

Abuse

Abuse makes any weapon less reliable – although firearms vary widely in their ability to cope with it. If using a gun that has spent 40 years abandoned in a closet or been rolled on by a falling horse, or after taking a swim or snatching it from the mud, *Slime, Sand, and Equipment Failure* (p. B485) applies.

Failure on the required HT roll may lower Malf. (p. B407), decrease Accuracy, or result in another penalty determined by the GM. Light damage might knock the sights out of alignment; heavier damage can crack the gun's frame, bend the barrel, break the stock, and so on. Stoppages and misfires (see *Malfunctions,* p. 81) are particularly likely results of abuse.

Sniper rifles and target pistols are a special case. They're precision instruments with specially selected and fitted barrels and actions, often mated with telescopic sights. Abused, they lose accuracy quickly. Weapons such as the H&K PSG1 (p. 116) and Remington M24 (p. 116) roll against HT rather than the usual HT+4. Failure results in -1 to -3 to Acc (GM's decision). Note that most weapons of this kind are optimized for a particular owner, too. Picking up somebody else's target weapon without adjusting stock and sights (requires an hour to shoot and fine-tune the gun) can mean reduced Acc even *without* abuse.

Make an IQ-based Guns, Gunner, Artillery, or Armoury roll (as appropriate) to detect and correct problems stemming from abuse. Depending on the severity of the abuse, this can mean anything from letting water drip out of the barrel to a two-hour date with the disassembled weapon, lots of solvent, and a toothbrush . . .

For gross physical abuse – such as a deliberate attempt to break the weapon – see *Damage to Objects* (p. 483). Firearms typically have DR 4, HT 10, and HP as given on the *Object Hit Points Table* (p. B558). Details may vary depending on quality and materials. However, many military weapons are rugged enough to qualify for DR 6, HT 11. Treat *famously* rugged weapons (such as the AK-47, p. 114) as ruggedized (p. 16) at no extra cost; they have DR 8, HT 12. *All* firearms are Unliving.

Age

Firearms don't improve with age. Old guns may have any number of problems – from cracked stocks and misaligned sights to "tired" recoil springs and actions that are rusted solid. Age reduces Acc and/or Malf., and may even leave the gun unable to fire at all until fixed by a gunsmith with the Armoury skill. The GM can hint at a weapon's age by mentioning the wire, electrical tape, or spot welds holding it together!

Firearm age isn't strictly a question of years – it can also mean excessive wear and tear. For example, a machine gun with tens of thousands of rounds through it will become unreliable as parts shake loose. This means increased stoppages or a tendency for components to rattle around during transport or use, decreasing Malf.

Immediate Action

Eventually, every gun suffers a stoppage. A trained gunman knows the steps that offer the best chance of returning his weapon to service. Such a standard "try this first" procedure is called *Immediate Action.* Basic rules for clearing a stoppage appear under *Stoppage* (p. B407). Below are some additional, *optional* details.

The basic -4 to the Armoury or IQ-based weapon skill roll always applies unless "bought off" with the Immediate Action technique (p. 251). However, Immediate Action is different for every firearm – any penalties to *shoot* the weapon that the gunman would have for tech level (p. B168), unfamiliarity (p. B169), and/or a default between Guns specialties (p. B199) apply to his Immediate Action roll as well. Weapon Bond (p. 250) gives its usual +1.

The time required for Immediate Action also differs between weapons. Three Ready maneuvers is an *average.* Immediate Action for a particular weapon may take more or less time.

For a magazine-fed automatic weapon (include a semiautomatic pistol, SMG, or assault rifle), the most likely fault is failure to feed from the magazine. Immediate Action is to tap the base of the magazine to confirm that it's seated, clear the chamber, and let the slide or bolt fly home to chamber another round. This takes two Ready maneuvers.

For a belt-fed automatic weapon, Immediate Action is to cock the weapon, open the feed cover, clear the feed tray of any links or expended cartridges, reinsert the belt, close the cover, and rack the bolt. This takes four Ready maneuvers. An assistant gunner can reduce this to three Ready maneuvers.

Revolver malfunctions are almost always misfires. Don't take Immediate Action – simply pull the trigger again! Similarly, a shooter with a multi-barrel gun can try to fire another barrel.

Most weapons have a certified barrel life – anything from tens of thousands of rounds for a modern pistol to a few hundred shots for a tank or naval gun. After that, Acc suffers. Penalties as severe as *halving* Acc would be reasonable.

In automatic guns, another weakness is the springs. Many professionals carry spare springs as part of their gun-cleaning kit (p. 160) so that they can replace worn ones as necessary. Trading weak factory springs for stronger ones can increase reliability in some weapons (see *Firearm Quality,* p. 79).

The springs in magazines are another common problem. Many shooters find that underloading their magazines improves reliability. British troops learned this lesson with Sten guns during WWII; U.S. soldiers, with M16s in Vietnam.

Malfunctions

When a firearm fails to discharge when the trigger is pulled, the source is most likely operator error or a mechanical malfunction. Both are covered by the optional rules under *Malfunctions* (p. B407). A malfunction is more likely for an untrained shooter. At the GM's discretion, anybody shooting at default or who doesn't meet the weapon's minimum ST requirement suffers -1 to his weapon's Malf. For other factors that can worsen Malf., see *Cleaning and Maintenance* (p. 80), *Abuse* (p. 80), and *Age* (p. 80-81).

When a malfunction occurs, roll on the *Firearm Malfunction Table* (p. B407) to determine what happened. The relative likelihood of misfires and stoppages varies by TL and weapon type:

For TL3-5 firearms, the most likely malfunction is a simple misfire . . . the gun doesn't go off at all. For early cartridge-firing weapons, another common problem is a stoppage – the cartridge becomes jammed in the chamber (*after* firing the shot), usually because of weak cartridge material. Prying the cartridge case from the weapon may be difficult.

For TL6-8 firearms, which seldom misfire but often jam, the GM may wish to reverse the occurrence of misfires and stoppages on the table. For automatic weapons, a stoppage usually means a feed jam – the next round in sequence can't reach the firing chamber (*before* firing the shot) or the empty case isn't properly ejected (*after* firing the shot).

Drawing Your Weapon

It normally takes one or more Ready maneuvers to draw a firearm; see *Ready* (p. B366) and *Readying Weapons and Other Gear* (p. B382). The time required depends on how the weapon is stowed – see *Holsters, Scabbards, and Slings* (pp. 153-154). An alternative popular with pistoleros is the Fast-Draw skill (p. B194). Below are several optional rules for Fast-Draw.

Fast-Draw

A successful Fast-Draw roll lets you ready a stowed weapon instantly, without taking a Ready maneuver. Every turn, you may Fast-Draw *one* gun per hand at no penalty – although draws with the "off" hand have the usual -4. For instance, a shootist could Fast-Draw a pistol with his master hand at no penalty and another pistol with his off hand at -4. Success and failure have their usual effects in all cases. Any failure ends your turn; you may not attempt Fast-Draw again that turn. Critical failure means you also drop the gun – or *both* weapons, if trying to draw two guns simultaneously!

Fast-Draw from Odd Positions

The Fast-Draw skill assumes that you're standing still with nobody holding onto you, able to use your master hand to reach your weapon. In close combat and other cramped quarters, you must make a DX roll to *reach* a weapon before you can Fast-Draw it (see *Readying in Close Combat,* p. B391). For added realism, apply the following modifiers to Fast-Draw rolls and DX rolls to reach weapons:

Crawling or lying down: -4
Crouching, kneeling, or sitting: -2
Grappled: -4
Hanging upside down: -2
Move or Move and Attack: -2 during or after the maneuver
Off-hand: -4

The weapon's *location* is another important modifier, the effects of which depend on the weapon and Fast-Draw specialty:

Long Arm: +0 if using a patrol sling (p. 154), -2 if slung over the shoulder, or -4 if slung on the back.
Pistol: +0 if tucked into the belt or holstered at your hip, -1 if holstered at the small of your back or in a shoulder holster, -2* if holstered in an ankle holster or stuck into a boot, or -3 if in a pocket or concealed.

* A weapon in a boot is *easier* to reach from low postures: when crouching, kneeling, or sitting, ignore the -2 for a weapon in a boot *and* the -2 for posture, and roll at +0.

All of these modifiers are cumulative with each other and those under *Fast-Draw* (above). Shock, distraction, and afflictions have the same effect on Fast-Draw rolls and DX rolls to reach weapons as they do on attack rolls.
Note that the type of holster, scabbard, or sling also affects how *quickly* you can draw a gun; see *Holsters, Scabbards, and Slings* (pp. 153-154).

Who Draws First?

A staple of cinematic gunfights and duels is the standoff between two gunmen who suddenly draw weapons and fire. Who draws first – and therefore gets the first shot – is crucial here!
If combat is in progress, resolve the situation using the turn sequence (see p. B363). The faster gunman takes his turn first. If his weapon is ready, or if he can Fast-Draw it, he gets the first shot. If he must take a Ready maneuver, his turn ends. Then the slower gunfighter takes his turn. If he has a weapon ready – or can Fast-Draw one – *he* gets the first shot. If he, too, must take a Ready maneuver, it's the faster fighter's turn again . . .
If combat *isn't* in progress, use the following rules:

● *Neither fighter has a ready weapon; one knows Fast-Draw, the other does not.* The shootist with Fast-Draw may roll against his skill. If he succeeds, he shoots first. If he fails, resolve this as a standoff between two fighters, neither of whom knows Fast-Draw (below). If he *critically* fails, he drops his weapon or shoots himself, and his foe fires first!
● *Neither fighter has a ready weapon;* ***both*** *or* ***neither*** *know Fast-Draw.* Roll a Quick Contest. Use *Fast-Draw* skill if both gunmen have it, *weapon* skill if neither does (or if one does, but failed his attempt). The winner fires first. In a tie, they shoot simultaneously! Regardless of the skill used, apply the modifiers under *Fast-Draw from Odd Positions,* plus these special modifiers:

Bulk: The shootist with the *worst* Bulk has -1 (his weapon takes longer to clear its holster or move from its slung position).

Trigger Mechanisms

Firearms can be classified by trigger mechanism as follows:

Single-action (SA) means that the hammer needs to be cocked before shooting. In the case of a *revolver,* the hammer must be cocked before each shot; therefore, single-action revolvers have RoF 1. In the case of a *self-loading weapon* – such as a semi-automatic pistol or rifle – the action cocks itself automatically after the first shot and the shooter can fire at RoF 3 on later turns. SA is standard on most TL5 revolvers and TL6 semiautomatic pistols, as well as on rifles, submachine guns, and machine guns at all TLs.
Double-action (DA) means that the weapon doesn't have to be cocked before firing, always allowing RoF 3. Due to the heavy trigger pull, though, *aimed* shots in DA mode suffer -1 Acc. The weapon *can* be cocked before firing, allowing a more accurate first shot in SA mode.
Double-action-only (DAO) means that the firearm *cannot* be fired single-action – only double-action, at RoF 3. This permanently reduces Acc. Due to the unavoidable heavy trigger pull, accidental discharge due to unsafe handling (p. 80) is almost impossible, which makes DAO popular with police forces.
Safe-action combines the best features of SA and DAO. Such guns have RoF 3, receive no penalty on aimed shots, and are almost impossible to discharge accidentally.

Hand on Weapon: A shooter with a hand already on his gun adds +4. Both fighters can claim this bonus.

● *One fighter has a ready weapon; his opponent knows Fast-Draw.* Roll a Quick Contest. The ready shootist uses weapon skill; his only modifier is +1 if he has Combat Reflexes. The unready gunman uses Fast-Draw skill modified as for a Quick Contest of Fast-Draw (above), with an additional *-10!* The winner shoots first. In a tie, the shooter with the ready weapon fires first.
● *One fighter has a ready weapon; his opponent lacks Fast-Draw skill.* The gunfighter with the ready weapon shoots first.

Shooting

Resolve attacks with firearms as explained in *Ranged Attacks* (pp. B372-374). See *Special Ranged Combat Rules* (pp. B407-414) for situations unique to guns and gunfights. The following rules add further optional detail.

Automatic Weapons

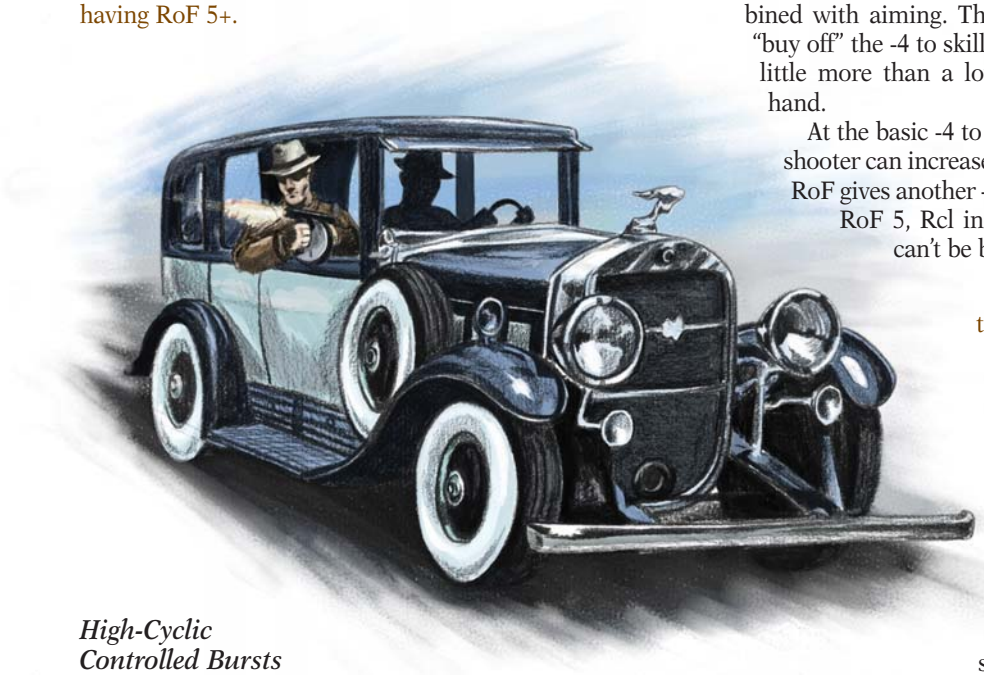
A full-automatic weapon with a fire selector – that is, a RoF 4+ weapon without a "!" after its RoF – can be set to fire either single shots or full-automatic (see p. B408). Changing modes normally takes a Ready maneuver. Certain firearms can switch *instantly,* however, thanks to a

double trigger (e.g., Rheinmetall MG34) or a progressive trigger where a light pull gives single shots and a heavy pull gives bursts (e.g., Steyr AUG). This is mentioned in the descriptions of such weapons.

Limited Bursts

Some weapons have a burst limiter, mainly to conserve ammo. The bursts are mechanically or electrically controlled, and consist of a fixed number of rounds – typically two, three, or four, depending on the gun. After that, the weapon stops firing, even if the trigger is still depressed. The shooter must squeeze the trigger again for another burst, and may fire up to three bursts per attack. Fast-firing (p. 84) *isn't* possible. The only game effects are that the number of shots per attack must be a multiple of the limited burst size and that such firearms can't use *Spraying Fire* (p. B409).

Example: The Beretta Mod 93R machine pistol (p. 100) can be set to fire three-round limited bursts. The shooter may choose between three, six, or nine shots per attack, so the weapon has RoF 9. He can't use *Spraying Fire,* despite having RoF 5+.



High-Cyclic Controlled Bursts

Some guns with *very* high rates of fire (25-35 shots per second) can fire short bursts so quickly that the bullets exit the barrel before recoil and muzzle climb affect the shooter. This is called a "high-cyclic controlled burst." Such weapons have a number sign (#) after RoF.

Guns firing high-cyclic controlled bursts are subject to *Limited Bursts* (above). In addition, they can't use *Suppression Fire* (p. B409). However, shots fired in controlled-burst mode have effective Rcl 1.

If the gun has selective fire, then in addition to firing at its controlled-burst RoF, it might be able to switch to its normal RoF and/or semiautomatic fire at RoF 3. Details appear in individual weapon descriptions.

Example: The H&K G11 assault rifle (p. 119) has RoF 9# when set on controlled bursts. Per its description, it fires three-round bursts; the shooter can fire three, six, or nine shots per attack in this mode. If he fires three bursts – nine shots – he gets +2 to his attack roll for rapid fire. Due to Rcl 1 in controlled-burst mode, success by 0 gives one hit, success by 1 gives two, success by 2 gives three, and so on. On a success by 8, all nine shots hit! If he selects normal full-auto mode, RoF 7, he can fire any number of shots between two and seven, and use *Suppression Fire,* but at the weapon's usual Rcl 2.

Fanning and Thumbing

Fanning and *thumbing* are flamboyant techniques used to increase the low RoF of single-action revolvers (p. 92). Both tricks are more typical of modern cowboy enthusiasts and movie heroes than of historical gunslingers.

Fanning

To fan a revolver, the shooter holds down the trigger while striking the hammer repeatedly with his other hand, quickly cocking and releasing it to fire the weapon. Fanning requires an attack roll at Guns (Pistol)-4, and can't be combined with aiming. The Fanning technique (p. 251) can "buy off" the -4 to skill; without it, most shooters manage little more than a lot of noise and possibly a bruised hand.

At the basic -4 to skill, fanning improves RoF to 2. A shooter can increase RoF to as high as 5, but each +1 to RoF gives another -2 to skill that *can't* be bought off. At RoF 5, Rcl increases by 2 as well (this problem can't be bought off, either).

Example: The Duke has no penalty to fire his Colt Peacemaker (p. 252) at its usual RoF 1. When fanning, RoF 2 gives him -4, RoF 3 gives -6, and RoF 4 gives -8, all at Rcl 3; RoF 5 gives -10 and Rcl 5! If he invested 5 points in the Fanning technique, he could fire at RoF 2 with no penalty, RoF 3 at -2, RoF 4 at -4, or RoF 5 at -6 (still at Rcl 5).

A critical failure means no shots are fired. As well, roll 1d. On 1-3, the shooter drops his gun. On 4-6, he bruises his hand; the margin of failure on the roll equals the number of minutes that he suffers moderate pain (p. B428).

Thumbing

Thumbing (or "slipping the hammer") is a one-handed technique. The gunman holds down the revolver's trigger as for fanning. He uses his thumb to pull the hammer back to full cock and then releases it to fire. A skilled shootist can fire *two* single-action revolvers at once this way!

Thumbing requires an attack roll at Guns (Pistol)-2. The Thumbing technique (p. 252) can "buy off" the -2. Success lets the shooter fire at RoF 2. Failure means he can't fire that turn. On a critical failure, he drops his gun or fires it prematurely, the shot going off wildly – the GM decides what it hits.

Weapon Modifications

A revolver can be temporarily modified for fanning or thumbing by tying back the trigger; it can only be used for fanning or thumbing until the tie is removed. A revolver can be permanently modified by *removing* the trigger. Make an Armoury (Small Arms) roll to remove the trigger. Anyone can tie it back.

Pistolero

Traditionally, pistols were held and fired using *one* hand. This was the case long after it was no longer common to use the other hand to grip a sword or a horse's reins. The ***Basic Set*** assumes one-handed shooting as standard – because for most of history, it was!

In the late 1950s, American competition shooter Jack Weaver developed the stable, two-handed shooting style that would eventually be known as the "Weaver Stance." There are other, similar stances. Initially, two-handed shooting was adopted by only a few. By the 1980s, though, it had become the dominant style for combat handgunners – including military and police.

Two-handed pistol shooting has several advantages. Multiply minimum ST by 0.8 (round up), reduce Bulk by one step, and treat all *aimed* shots as braced (see *Aim,* p. B364). This stance isn't compatible with fanning and thumbing (p. 83), though.

There's another advantage to firing single-action revolvers two-handed: the shooter can use the thumb of his off hand to cock the hammer. This increases RoF to 2. It isn't compatible with thumbing or fanning, but allows fast-firing (see below). Historically, this practice wasn't widespread, but an Old West shootist *could* develop it. It's common among modern single-action shooters.

Fast-Firing

The RoF 3 listed for most semiautomatic weapons and double-action revolvers assumes that the shooter will fire no more than three times a second. In practice, one *can* pull the trigger up to twice as fast . . . often to the detriment of actually scoring a hit. Pulling the trigger quickly can increase RoF to as high as 6 – at -4 to Guns. Learn the Fast-Firing technique (p. 251) to "buy off" this penalty. Increase Rcl by 2 at RoF 5 and by 4 at RoF 6. Even with RoF 5+, you can't use *Spraying Fire* (p. B409) with a weapon that isn't in fact a full-automatic weapon, but you *can* use *Suppression Fire* (p. B409).

Example: Morton Locke can fire his Colt .38 Super (pp. 98-99) at RoF 3 with Rcl 3. Fast-firing, he could choose RoF 4 at -4 to skill and Rcl 3, RoF 5 at -4 and Rcl 5, or RoF 6 at -4 and Rcl 7. If he invested 5 points in the Fast-Firing technique, he could shoot with no skill penalty at RoF 4-6, but he'd *still* suffer extra Rcl at RoF 5-6.

Single-action revolvers with RoF 1 can be fired two-handed at RoF 2 at no penalty (see *Pistolero,* see left). Fast-firing can further increase this to as high as RoF 4, at -2 to Guns. The Two-Handed Thumbing technique (p. 252) lets one "buy off" this penalty.

Precision Aiming

A sniper with specialized gear and plenty of time can make a very accurate shot by correcting his aim for every possible factor and waiting for the perfect moment to shoot. At the GM's option, a marksman with suitable equipment (at minimum, a place to brace, a scope, ballistic tables matched to rifle and ammunition, and a wind gauge), acting alone or with a trained spotter (Observation at 12+) equipped with binoculars or a spotting scope (p. 47), can exceed the usual limits on Aim (p. B364).

The first second of Aim gives +Accuracy and the next two seconds give another +1 or +2, as usual. Time above and beyond the initial three seconds gives a further bonus according to *Time Spent* (p. B346): +1 for 2× as long (6 seconds), +2 for 4× as long (12 seconds), +3 for 8× as long (24 seconds), +4 for 15× as long (45 seconds), and +5 for 30× as long (90 seconds). An extra +5 is the maximum – but in practice this bonus can't exceed the *lower* of the bonus from targeting systems (scopes, sights, etc.) and the weapon's basic Accuracy.

The extra time is used to make fine adjustments that are difficult without special training. Each additional +1 claimed requires an IQ-based Guns roll at -6. A sniper would have to roll five times – at 6, 12, 24, 45, and 90 seconds – to claim an extra +5. The GM may penalize these rolls in adverse conditions (wind, rain, dust, bad terrain, etc.) or give bonuses under ideal circumstances (dead calm, familiar location, etc.). The Precision Aiming technique (p. 251) can "buy off" the basic -6.

Success increases the bonus; the sniper may then shoot or keep aiming. Failure on *any* roll means *all* aiming bonuses are lost – the shooter must start over. Critical failure means the target sees a protruding barrel or glint off the scope!

Example: Red Army sniper Svetlana Romanova has Guns (Rifle)-14 and Precision Aiming (Rifle)-15. She's using a Mosin-Nagant V-1891/30 sniper rifle (p. 111) with Acc 5 and a scope giving +2 Acc. It's braced on a window sill for another +1. Her target is motorcycle scout Hugo Elting, talking animatedly to a Panzer crew 300 yards away.

After three seconds of Aim, Svetlana has +10 to hit: +5 basic Acc, +2 for the scope, +1 for bracing, and +2 for two extra seconds of Aim. She doesn't want to miss, so she keeps aiming. After six seconds of Aim, she must roll against her Precision Aiming technique. She succeeds and gets another +1, for +11 to skill. After 12 seconds of Aim, she succeeds again and the extra bonus becomes +2, for a total +12. She can't go any higher – her limit is the *lower* of the scope bonus (+2) and Acc bonus (+5).

She squeezes the trigger and makes an All-Out Attack (Determined), for +1, to the vitals, for -3. With the +12 for Aim and -13 for range, Svetlana needs an 11 or less to hit. She rolls a 10 and the German drops.

Ranged Rapid Strike

Rapid Strike (p. B370) is normally restricted to melee attacks, but the GM may optionally allow anyone using a firearm with RoF 2+ to perform a "Ranged Rapid Strike" at the usual -6 to skill. To buy off the -6, learn the Quick-Shot technique (p. 252). The two attacks can engage different targets, subject to the target restrictions in the first paragraph of *Spraying Fire* (p. B409). Ranged Rapid Strike and Dual-Weapon Attack (p. B417) *cannot* be combined.

Special Shooting Situations

Certain environments pose special challenges to shooters.

Firing Underwater

Firing an ordinary TL6-8 firearm underwater isn't impossible – it's just extremely inefficient. Even a high-powered rifle gets only a few feet of range! Multiply the underwater distance to the target by 1,000 to check if it's in range.

As well, reduce Malf. by 1 for all weapons and by 2 for automatic weapons (including self-loading pistols). Only cased ammunition with sealed primers is reliable; caseless ammo might work *shortly* after immersion, but will eventually fail. Hollow-point ammo can't be used – it expands prematurely, either damaging the gun or reducing effective range to nil.

Firing into Water

Shooting at an underwater target is difficult – as may be *seeing* the target in the first place. The projectile will be deflected considerably at some entry angles. All shots going *into* the water are at -4 to hit. As well, the water slows down the round, with the same effects on range as shooting underwater (above).

Example: Special Agent Lou Lafayette is standing on a Coast Guard vessel and shooting his H&K MP5/10A3 submachine gun (p. 123), at -4 to skill, at a tentacled monstrosity swimming 4' below the surface. That 4' of water counts as 4' × 1,000 = 4,000', or 1,333 yards. This is past his weapon's 1/2D; if the bullets hit, they'll do half damage. Worse, Lou has only FBI-issue HP rounds, which instantly deform on impact with the water. This means *no* effective hits! He might have a chance if he had solid bullets, but the creature would only need to dive to 10' – increasing effective distance to 10' × 1,000 = 10,000', or 3,333 yards – to be outside the gun's Max of 3,100.

Firing into the Air

Firing *any* firearm (including small arms and specialized antiaircraft artillery) into the air at an elevation of 50°-90° reduces its range to 80% normal.

Example: A gargoyle flying at an altitude of 5,000' is well out of range of Lafayette's Glock 23 (p. 101). The pistol's Max is reduce to 1,800 × 0.8 = 1,440 yards, or 4,320'.

Firing in Space

In space, vacuum (p. B437) evaporates lubricants while temperature extremes affect a firearm's internal mechanisms. *All* automatic TL6-8 firearms have Malf. 14 when fired in space. This doesn't apply to revolvers or manual repeaters.

Sustained Fire

Firing many shots in a short period rapidly heats up any firearm, even a manual repeater. The faster the rate and the more powerful the round, the quicker the heat builds up. This may temporarily or even *permanently* damage the weapon. Red-hot barrels warp, reducing Acc. An overheated gun is also more likely to jam or "cook off" (fire a chambered round due to heat alone).

For pistols, rifles, SMGs, and shotguns, reduce Acc and Malf. by 1 after firing 100 rounds in under a minute. Reduce this to 50 rounds for weapons noted on the table as "unreliable" or "very unreliable"; raise it to 150 rounds if the gun is fine (reliable) or noted as "very reliable," or to 200 rounds if very fine (reliable). Multiply these numbers by 0.75 for a TL6 weapon or by 1.5 for TL8 hardware, and by 1.25 for a well-maintained weapon *and* feed device at any TL (see *Cleaning and Maintenance,* p. 80). Letting the weapon cool for at least 15 minutes returns it to normal – but after firing three or more times the safe number of rounds, Acc loss (but not Malf. reduction) becomes permanent.

Machine guns and autocannon – with heavier barrels and better cooling arrangements – have a higher safe number of rounds per minute, rated in three fire modes:

Sustained: Bursts of less than RoF in length, with pauses of 4-5 seconds; overheats after 800 shots.

Plinking vs. Combat Shooting

The Guns skill covers using a firearm in a *life-threatening* situation. This usually but doesn't necessarily mean combat. A hunter pursuing dangerous game is, by definition, in danger.

Many people only shoot in *safe* situations, though – "plinking" on cans in the backyard, shooting at paper targets on the firing range, or competing in marksmanship contests. Such activities typically take place in comfortable, well-lit settings where there's plenty of time to aim and the distance to the targets is well-known. Those making long shots at an outdoor range have a windsock to help adjust aim, a hunter shooting from his favorite deer stand knows when and where his prey will likely appear, and so on.

Conditions like this are much more favorable than those encountered in combat, and should provide skill bonuses as outlined under *Task Difficulty* (p. B345). The bonus for a typical non-combat situation is +4. The GM may grant up to +10 when firing from a rest at a brightly colored soda can on a calm, sunny day.

Note also that All-Out Attack (Determined) (p. B365) grants +1 to skill. This is common in most of the above situations. Target shooters are rarely prepared to dodge!

Careful Loading

Taking the time to load carefully has a marked effect on the accuracy of muzzleloaders. Smoothbores in particular are more accurate when firing a well-fitted, tightly patched ball from a clean barrel. A perfectly smooth ram of the load and/or an exactly measured quantity of priming can affect the likelihood of the gun firing and scoring a hit. One reason that TL5 military commanders like to save the first volley for as long as possible is that it's the one that's most carefully loaded. In game terms, *doubling* the loading time for a muzzleloading musket or rifle gives +1 Acc.

Black-Powder Fouling

Black powder produces considerable fouling, as unburned solid waste builds up. A gun's barrel must be swabbed out after every shot to remove as much fouling as possible. Any kind of watery liquid, including urine, will do. Saliva works well – shooters commonly hold a patch in their mouth until it's saturated. All listed loading times *include* this hasty bare minimum of swabbing.

In a long fight, carbon and lead buildup can have immediate adverse effects on accuracy, loading speed, and reliability. After every five shots, the firer must take a two-minute break to clean his gun *thoroughly.* For every five shots without cleaning, increase basic loading time by 10% (round up) and reduce Malf. by one step. For every 10 shots without cleaning, lower Acc by 1, too.

Battlefield swabbing can't remove all of the fouling. Cleaning and oiling the gun is a necessary after-battle chore. Black powder is corrosive and attracts moisture. A few hours in a damp climate can ruin an uncleaned weapon.

Rapid: Bursts of less than RoF in length, with pauses of 2-3 seconds; overheats after 400 shots.

Assault: Long bursts or bursts of less than RoF in length, with no pauses (as in typical action-movie scenes); overheats after 200 shots.

Multiply these safe numbers by 0.5 for a light barrel or by 1.5 for an extra-heavy barrel (see weapon description); by 0.75 for a TL6 weapon or by 1.5 for a TL8 one; and by 1.25 for a well-maintained weapon and feed device. Firing three times the final safe number reduces Acc and Malf. by 2, making even a burst barrel likely! Changing the barrel (see *Machine Guns and Autocannon,* pp. 129-137) is often preferable to a long cooling period. Water-cooled guns can fire until the water is gone (see *Water-Cooled Machine Guns,* p. 129), after which they follow the rules above.

Example: A Saco M60 (p. 134) is TL7 – and for this example, well-maintained. In sustained mode, it can safely fire 800 × 1.25 = 1,000 shots before a barrel change or longer cooling period. In assault mode, this drops to 200 × 1.25 = 250 rounds.

Reloading Your Gun

A firearm other than a single-use throwaway weapon needs to be reloaded after firing all of its shots. Depending on ammunition class (pp. 163-165) and weapon design, this can take some time.

Multi-Part Ammo

Loading multi-part ammo – powder, shot, and wadding – is a rather involved process. Briefly, you must pour in the propellant, usually from the muzzle; then insert and ram down the projectile, followed by the wadding; and finally fit the igniter to the action. The number of Ready maneuvers (seconds) required varies by weapon type, but some general rules apply:

- A self-measuring powder flask (see *Powder and Shot,* p. 163) subtracts five seconds from the *final* loose-ammunition loading time.
- A self-priming pan (see weapon description) subtracts 10 seconds, but this benefit isn't cumulative with that of a self-measuring flask.
- Paper cartridges *halve* the basic time required (round up), and supersede both of the above measures.
- Loading a muzzleloading shoulder arm – *not* a pistol – while in any posture other than standing multiplies the basic time required by 1.5 (round up). Loading while mounted requires a roll against the lower of Guns-3 and Riding-3; loading on a moving vehicle requires a Guns-2 roll.

Muzzleloading musket or shotgun with flintlock or caplock action. Takes 40 seconds. A successful Fast-Draw (Ammo) roll reduces this to 30. A double-barreled weapon *doubles* the time required.

Muzzleloading rifle with flintlock or caplock action. Takes 60 seconds. Fast-Draw (Ammo) reduces this to 50. Multiply by 0.7 (round up) if using a greased patch (p. 107). A double-barreled weapon *doubles* the time required. Treat a rifle as a musket when firing Minié balls (p. 109).

Example: Reloading a Kentucky rifle (p. 107) takes 60 seconds, or 50 with a successful Fast-Draw (Ammo) roll. A greased patch – used by most American shooters – reduces these times to 42 and 35 seconds, respectively. With a self-measuring powder flask, reduce *all* of these times by five seconds, to 55, 45, 37, and 30 seconds, respectively.

Muzzleloading smoothbore pistol with flintlock or caplock action. Takes 20 seconds. Fast-Draw (Ammo) reduces this to 16.

Muzzleloading rifled pistol with flintlock or caplock action. Takes 30 seconds. Fast-Draw (Ammo) reduces this to 24.

Muzzleloading smoothbore revolver with flintlock or caplock action. Takes 20 seconds *per chamber.* Fast-Draw (Ammo) reduces this to 16 *per chamber.*

Muzzleloading rifled revolver with flintlock or caplock action. Takes 30 seconds *per chamber.* Fast-Draw (Ammo) reduces this to 24 *per chamber.*

Breechloading musket, shotgun, or rifle with flintlock or caplock action. Takes 10 seconds, *regardless of position.* Fast-Draw (Ammo) reduces this to 8.

After the Firefight

Gunshots are *loud,* especially indoors. After a firefight, everybody will be temporarily hard of hearing from the noise (if explosions were involved, see also *Side Effects of Explosions,* p. 181-182). Apply -4 to Hearing rolls if all of the shooting was outdoors, -5 if inside a building or vehicle. Protected Hearing prevents these penalties; see *Ear Protection* (p. 70).

At night, brilliantly intense muzzle flashes, tracers, and so on will impair natural night vision. This gives an *additional* -2 to Vision rolls in the dark. Protected Vision prevents this effect; see *Eye Protection* (pp. 70-71).

In either case, impairment lasts for (20 - HT) minutes, minimum one minute. After that, roll vs. HT every second to recover.

Fixed Ammo

Fixed ammo – from the earliest metal cartridges to caseless rounds – is easier to handle and thus faster to load. Loading while mounted still requires a skill roll, but it's against the lower of Guns-1 and Riding-1.

Single- or multi-barreled breechloader. It takes one Ready maneuver to open the breech, one to remove the spent cartridge, one to retrieve a fresh cartridge, one to insert it, and one to close the breech. A successful Fast-Draw (Ammo) roll reduces this time from five seconds to four. A multi-barreled weapon adds three seconds per *extra* barrel; Fast-Draw reduces this to two seconds per extra barrel.

Single- or multi-barreled breechloader with ejector. It takes one Ready maneuver to open the breech (automatically ejecting the case), one to retrieve a fresh cartridge, one to insert it, and one to close the breech. A successful Fast-Draw (Ammo) roll reduces this time from four seconds to three. A multi-barreled weapon adds two seconds per *extra* barrel; Fast-Draw reduces this to one second per extra barrel.

Examples: Reloading a double-barreled breechloading shotgun with no ejector, like the Remington Hammer Lifter (p. 104), takes eight Ready maneuvers, six with Fast-Draw, or four with Double-Loading (p. 251). A gun with an ejector, like the LeFever Automatic Hammerless (pp. 104-105), takes only six Ready maneuvers, four with Fast-Draw, or three with Double-Loading.

Gate-loading revolver. It takes one Ready maneuver to open the loading gate, one to push each empty case through the gate using an ejector rod (weapons *without* an ejector rod require at least two seconds per case), one to retrieve each new cartridge, one to insert each round, and one to close the gate. A successful Fast-Draw (Ammo) roll reduces this time by a second per cartridge.

Example: Reloading a six-shooter with loading gate, like the Colt Peacemaker (p. 95), takes 20 seconds, or 14 with Fast-Draw.

Break-open revolver with ejector. It takes one Ready maneuver to open the breech (automatically ejecting *all* cases), one to retrieve each new cartridge, one to insert each round, and one to close the gun. A successful Fast-Draw (Ammo) roll reduces this time by a second per cartridge. Using a speedloader (p. 155) shortens the procedure to five Ready maneuvers: one to open the gun, one to retrieve the speedloader, one to insert the cartridges, one to release them, and one to close the gun. Fast-Draw (Ammo) cuts this time to just three seconds.

Swing-out revolver. It takes one Ready maneuver to swing out the cylinder, one to manually eject all the cases at once, one to retrieve each new cartridge, one to insert each round, and one to close the cylinder. A successful Fast-Draw (Ammo) roll reduces this time by a second per cartridge. Using a speedloader (p. 155) simplifies the procedure to six Ready maneuvers: one to swing out the cylinder, one to eject the cases, one to retrieve the speedloader, one to insert the cartridges, one to release them, and one to close the gun. Fast-Draw (Ammo) cuts this time to four seconds.

Example: Reloading a modern revolver with swing-out cylinder, like the S&W Model 10 (pp. 95-96), takes 15 seconds, nine with Fast-Draw, or six with Double-Loading (p. 251). Employing a speedloader reduces this to six Ready maneuvers, or four with Fast-Draw – but Double-Loading doesn't help.

Internal magazine. For weapons with loading gates – like many shotguns and lever-action rifles – it takes one Ready maneuver to retrieve each cartridge and one to insert it. A successful Fast-Draw (Ammo) roll reduces this time by a second for every three cartridges or fraction thereof.

Example: Reloading a Remington Model 870 (pp. 105-106) takes 10 seconds, or eight with Fast-Draw.

Other weapons with internal magazines – like clip-loaded pistols and all bolt-action rifles – require the user to open the action, retrieve and insert ammunition (either individual rounds or a charger clip), and then close the action. Opening *and* closing the action takes one Ready maneuver. Retrieving and inserting ammo takes two Ready maneuvers per cartridge or clip, or one per cartridge or clip with a successful Fast-Draw (Ammo) roll. Some weapons (like the Enfield SMLE Mk III, p. 112) use *several* clips.

Examples: Reloading a Winchester Model 70 bolt-action rifle (p. 113) with loose cartridges takes 11 seconds, or six with Fast-Draw. Reloading a Mauser Kar98k bolt-action rifle (p. 111) with a charger clip takes three Ready maneuvers, or two with Fast-Draw.

Detachable magazine. It takes one Ready maneuver to eject the empty magazine, one to retrieve a fresh one, and one to insert it. Clamped magazines (p. 155) *or* a successful Fast-Draw (Ammo) roll reduces this time from three seconds to two – as does an assistant gunner for a machine gun. Bulky drums or inconveniently placed magazines require five seconds, as they take longer to handle and/or insert; Fast-Draw (Ammo) *or* an assistant gunner speeds this to three seconds.

Belt or strip feed. It takes one Ready maneuver to open the feed, one to retrieve the new belt or strip, two to insert it, and one to close the feed. A successful Fast-Draw (Ammo) roll *or* an assistant gunner reduces this time to three seconds.

. . . And One in the Chamber

Automatic firearms (both semi- and full-automatic) are categorized as firing from either a *closed-* or an *open*-bolt position. Closed-bolt weapons already have a round chambered when the trigger is pulled; open-bolt weapons must feed a round first. Closed-bolt weapons use the "Shots *n*+1" notation, which means that they can carry one extra round directly in the chamber. Open-bolt weapons use "Shots *n*"; they can't load an additional round. All other effects – on reliability, accuracy, rate of fire, cost, etc. – are already included in the weapon statistics and need no further consideration.

Air Guns

Guns that use compressed air to propel a projectile *technically* aren't "firearms" at all, but don't significantly differ from them in rules terms. The first examples are hand-built custom models dating to the early 17th century (mid-TL4). Mass-produced hunting and military air rifles appear at TL5.

For most of TL5, the limitations of loose powder and shot mean that it's easier to build a repeating air gun than a black-powder repeater – despite the fact that air reservoirs are unreliable and successive shots are at progressively lower velocities owing to loss of pressure. At late TL5, the metallic-cartridge repeater usurps the air gun's unique status as a multi-shot weapon impervious to humidity and rain. Air guns retain the advantages of flashless and comparatively quiet firing, however.

At TL5, air guns are expensive and thus used only by the wealthy or those in need of their operational advantages. After 1850, they're available in commercial centers such as Berlin, Paris, London, and New York for about the same price as black-powder guns. Custom builders can still make a better product, but charge exorbitantly. At TL6-8, the air gun is mostly a toy or a hobby item, for children or for target shooters, but the technology is also used for specialized weapons.

Steyr-Girandoni M.1780, 11.75mm (Austria, 1780-1798)

Developed by Bartholomeo Girandoni, this was the only *Windbüchse* ("air rifle") ever to be a standard military weapon. Some 1,500 were made. First issued to selected Austrian army snipers, an entire corps was armed with it in 1790. It saw service against Turkey (though not against Napoleon's troops, as often claimed), but the weapon was decommissioned in 1806. The basic design was copied for hunting arms during the early 19th century. Recent research suggests that the air gun carried by the Lewis and Clark Expedition (1804-1806) was a Girandoni pattern.

The weapon resembles a flintlock rifle, but the shoulder stock consists of the detachable air reservoir: a leather-covered iron flask, filled using a hand pump (2,000 strokes, taking about 30 minutes!), that holds enough air for 30 shots. The first 10 shots have the damage and range in the table; the next 10, Dmg 1d+2 pi+, Range 50/400; and the last 10, Dmg 1d+1 pi+, Range 40/340. Bullets are stored in a tube magazine parallel to the barrel, on the gun's right-hand side. Pushing the breechblock across and cocking the "hammer" loads a bullet from the magazine and makes the gun ready to fire. The weapon is relatively fragile and suffers under field conditions (Malf. 16).

Air Guns Table

See pp. B268-271 for an explanation of the statistics. Note that air guns with no real combat application use Guns Sport skills.

GUNS (MUSKET) (DX-4 or most other Guns at -2)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
8	Dan-Inject JM Standard, 11mm *follow-up*	1d pi- drug effect	3+2	45/150	6.6/0.02	1	1(3i)	8†	-5	2	$1,950	4	[1]
8	FN 303, .68 FN	1d-3(0.5) cr	3	25/110	4.5/0.5	3	15(5)	7†	–	2	$1,100/$21	2	[2]

GUNS (RIFLE) (DX-4 or most other Guns at -2)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
5	Steyr-Girandoni M.1780, 11.75mm	2d pi+	1	60/480	9.6/0.4	1	21+1(2i)	10†	-6	2	$1,000	3	[3]

GUNS SPORT (MUSKET) (DX-4 or Guns (Musket)-3)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
7	Daisy Number 111 Red Ryder, .175 BB	1d-4 pi-	0	25/140	3/0.8	1	1,000(2i)	5†	-4	1	$50	4	

GUNS SPORT (PISTOL) (DX-4 or Guns (Pistol)-3)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
8	NSG SplatMaster, .68 Paintball *follow-up*	1d-3(0.2) cr paint splat	1	2/30	2.1/0.07	1	10+1(5)	8	-2	2	$140	4	[3]

Notes:

[1] Air charge lasts for 40 shots.

[2] Air charge lasts for 110 shots. Clamps under rifle or carbine: add weight to weight of host weapon and add -2 to weapon's Bulk.

[3] Air charge lasts for 30 shots.

Ranged Electric Stunners Table

See pp. B268-271 for an explanation of the statistics.

GUNS (PISTOL) (DX-4 or most other Guns at -2)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
7	Tasertron TE-76 *follow-up*	1d-3 pi- HT-3(0.5) aff	0	5	2/0.1	1	1(5)	8	-2	2	$350	3	[1]
8	TASER M26 *follow-up*	1d-3 pi- HT-5(0.5) aff	0	7	1.1/0.25	1	2(3i)	7	-2	2	$400	4	[2]

Notes:

[1] On a failed HT-3 roll, victim is stunned while trigger is depressed and for (20 - HT) seconds afterward, and can then roll vs. HT-3 to recover. Integral tactical light (p. 52).

[2] On a failed HT-5 roll, victim is stunned while trigger is depressed and for (20 - HT) seconds afterward, and can then roll vs. HT-5 to recover. Integral targeting laser (pp. 56-157).

Each man was issued three 3-lb. flasks (extras cost $500 apiece – they're one of the hardest parts to make) and four 0.6-lb. tubes holding 20 bullets. Exchanging the reservoir takes 15 seconds. Topping up the magazine from a tube takes five seconds.

Daisy Number 111 Red Ryder, .175 BB (USA, 1940-1954)

Perhaps the most famous air gun ever, this was a smoothbore children's toy modeled after an Old West lever-action carbine and named after a comic-strip cowboy. Over 6.5 million were made. Since 1972, Daisy has introduced very similar but updated models.

The Number 111 holds 1,000 small steel pellets in the tube below the barrel. Cocking the lever compresses a spring and loads a bullet. When the trigger is pulled, the spring compresses the air behind the bullet and forces it down the barrel. Don't shoot your eye out!

NSG SplatMaster, .68 Paintball (USA, 1985-1995)

Based on smoothbore marking guns used since 1970, the SplatMaster was the first dedicated paintball game pistol, popular during the paintball craze of the late 1980s and early 1990s. It's powered by a 12g CO^2 cartridge ($1, 0.1 lb.) in the pistol grip, containing 30 charges. Paintballs are loaded into the tube magazine above the barrel using a 10-round speed-loading tube. The gun must be manually cocked after each shot. The paintballs – usually filled with red paint – leave a 3"-diameter splat on impact.

Dan-Inject JM Standard, 11mm (Denmark, 1996-)

A bullpup, smoothbore air gun firing darts for animal control, employed by wildlife conservationists and zoo vets around the world. It features a 4× scope. It's powered by a 72g CO^2 cartridge ($20, 0.25 lb.) under the barrel, containing 40 charges.

The 11mm dart consists of a feather-finned, 0.05-fl. oz. syringe fitted with a sturdy 2mm needle intended to puncture the skin of large animals such as lions or elephants. It can inject one to six doses of liquid anesthetic; roll against Veterinary (or Physician if used against humans, xenomorphs, etc.) to determine the correct dosage. A typical drug requires a HT-3 roll. For each point by which the target fails, he loses 1d FP – although the drug may need from a few seconds to several minutes to take full effect. The victim recovers 1 FP every 10 minutes, as usual. A tracking device is also available (p. 210).

FN 303, .68 FN (Belgium, 2001-)

This smoothbore air gun was developed for use by security and military forces in antiriot situations. Both European and U.S. police forces adopted it. It attaches under the barrel of an assault rifle, but can be fitted with a shoulder stock for use as a standalone weapon (Wt. 5.1, Bulk -4).

The FN 303 is powered by a 72g CO^2 cartridge ($20, 0.25 lb.) mounted parallel to the barrel, containing 110 charges. A detachable 15-round drum magazine holds the projectiles. Options include baton (in the table), paintballs containing washable or permanent paint (Dmg 1d-3(0.2) cr, leaves a 3"-diameter stain), and a pepper projectile (acts as a paintball *and* treats the target to a dose of pepper spray, p. 180).

Ranged Electric Stunners

Ranged electric stunners appear at late TL7 – first sold under the trade name TASER (Thomas A. Swift's Electric Rifle). They simultaneously fire a pair of darts connected to a power source by trailing wires (minimum range is one yard, to allow the darts to spread). The projectiles inflict minimal damage (1d-3 pi-) but transmit a high-voltage, low-amperage electric current. The victim must make a HT-3 roll or be stunned.

At TL8, some stunners cause electromuscular disruption (EMD) instead. The target must make a HT-5 roll or be knocked down and *paralyzed*. For more on both kinds of stunners, see *Nonlethal Electrical Damage* (p. B432).

An afflicted victim remains incapacitated for as long as the wires are connected and the trigger is depressed – typically for 5-10 seconds – and can't *intentionally* detach the darts during this time. He continues to suffer the weapon's effects for (20 - HT) seconds after the current is switched off (minimum one second). After that, he may roll against HT each second to recover, at a penalty equal to the modifier for the shock's strength (-3 or -5). Note that a stunner's electric current may start a fire if the victim is covered in flammable liquid such as alcohol, gasoline, or many pepper sprays!

Most ranged electric stunners can also function as stun guns (p. 199) in close combat, provided at least one cartridge remains unfired.

Stunners are controlled in some jurisdictions, ignored in others. Where they're controlled, they're treated like knives or firearms. Where they aren't controlled, use of a stunner might be *assault* but not a weapons violation!

New Old Guns

Time travelers looking for firearms that won't draw attention where they're going can buy brand-new versions of guns from previous TLs. For instance, it's possible to make a TL6 revolver with all the benefits of TL8 machining and materials. It could even be crafted to resemble a well-used antique. Only close inspection by an expert would reveal that something is strangely *wrong* with it.

Modern reenactors and shooting enthusiasts can buy TL8 versions of virtually any gun ever made, often with subtle improvements that correct the weapon's historical problems: smoother trigger and cocking mechanisms, stiffer barrels, precision-cut rifling, etc. The GM may permit modern PCs to buy firearms custom-designed to work better than historical originals. For example, TL7-8 replicas of the Colt M1847 Walker (p. 93) don't have that gun's disturbing tendency to blow up . . .

Tasertron TASER TE-76 (USA, 1976-1986)

The TASER TE-76 was the first ranged electric stunner. It saw widespread service with American police forces – including the LAPD and NYPD – from 1978, but was illegal for civilians in many U.S. states and abroad. It can be seen in the Dirty Harry movie *The Enforcer.*

The TE-76 resembles a large flashlight, and in fact incorporates an integral flashlight with a 5-yard beam. It uses conventional propellant to fire the darts (which led to its classification as a firearm). Each cartridge costs $16. It requires batteries: S/100 seconds.

TASER M26 (USA, 1999-)

The M26 Advanced TASER differs from older designs by using compressed air instead of firearm propellant. It's in service with thousands of police agencies in the U.S. and elsewhere, often replacing the older TE-76. The M26 resembles a black plastic pistol, with batteries (8×XS/40 seconds) in the grip, two air cartridges ($20, 0.15 lb. each) in the muzzle, and an integral targeting laser (pp. 156-157) that switches on automatically when the safety is disengaged. It uses EMD technology. The current is automatically applied for five seconds, unless cut off earlier by the operator. Without air cartridges, it can still function as a stun gun (p. 199) in close combat.

The M26 incorporates two measures intended to make it easier to hold the user accountable. First, a built-in computer chip stores the time and date of each firing. This can be read by a computer plugged into the gun's data port. Second, each discharged cartridge scatters dozens of microfilm-printed ID tags at the scene of the shot.

The *M18* (1999-), a civilian version, has Range 5.

The *MX Animal TASER* (2002-) is intended to stun large animals of several hundred pounds weight. It has the same stats as the M26, but requires a HT-10 roll! It isn't certified for use against humans, and is restricted (LC3).

The *X26* (2003-) is a smaller variant using the same air cartridges as the M26 but a different battery (S/1,500 seconds): Wt. 0.75, Cost $800. Its laser can be switched on or off at will. It also features *two* integral flashlights with 10-yard beams. U.S. Army military police mount it under the Colt M4 carbine (pp. 19-120) using an accessory rail (p. 161).

Non-Repeating Pistols

At early TL5, nearly all pistols are single-shot weapons. By mid-TL5, multi-barrel designs are available. Non-repeating pistols become rare after the introduction of the metallic cartridge – people generally prefer to have more than one or two shots if possible! Non-repeating designs produced at TL6-8 are mostly special-purpose firearms for which the number of shots isn't a top priority. Such weapons include holdout guns, which above all must be small, and target pistols, which most of all must be accurate.

Wogdon Dueller, .45 Flintlock (U.K., 1760-1797)

This product of famous London gunsmith Robert Wogdon was popular with British and American gentlemen. His smoothbore guns were designed for accuracy and certainty of fire; they're as reliable as a flintlock can be built. Similar guns by other makers were used for both dueling and target shooting. (Wagering on target shoots was a favorite form of gambling in England and America.)

The weapon comes with accessories – loading ramrod, bullet mold, powder flask, cleaning kit, etc. – in an expensive wooden case. All dueling and most target pistols were sold as cased pairs. If a singleton is available, it's probably stolen. The listed RoF is the fastest loading time; duelists often take twice as long to get +1 Acc (see *Careful Loading,* p. 86).

Tower Sea Service P/1796, .56 Flintlock (U.K., 1796-1840)

The Sea Service Pattern 1796 was a flintlock pistol with a 12" smoothbore barrel, adopted by the Royal Navy. Other navies – and privateers – used similar guns extensively during the 18th century. It featured a hook to hang it from the belt. In action, it was fired once upon boarding, turned around and gripped by the long barrel (a Ready maneuver), and then used to bash in heads (swing+1 crushing, uses the Axe/Mace skill).

MAS Pistolet AN IX, 17.1mm Flintlock (France 1801-1807)

This flintlock pistol had an 8.25" smoothbore barrel and was used by cavalry and dragoons in the Napoleonic Wars. Troops typically carried a brace of pistols in holsters slung across the pommel of the saddle. The weapon was hefty enough for bashing foes when empty (swing+1 crushing, uses the Axe/Mace skill). Some 66,000 were made.

Use the same stats for the *Mle 1777* (1779-1787) and the *AN XIII* (1806-1817), as well as for the .69-caliber North &

Cheney *M1779* (1779-1801), a copy of the Mle 1777 and the first U.S. military pistol.

Rigby Traveling Pistol, .75 Flintlock (U.K., 1820-1851)

During the late 18th and early 19th centuries, the threat of highwaymen was constant – infamously so in the rural areas around London. Gentlemen therefore habitually carried a "traveling" or "overcoat" pistol, small enough to be easily concealed. This smoothbore specimen was made by the Rigby family business of Dublin, Ireland.

Deringer, .44 Caplock (USA, 1850-1868)

Made by gunsmith Henry Deringer of Philadelphia, this was a small, sleek gun of superior workmanship. Deringer sold his custom-made pistols as cased pairs and even in sets of four; it's *much* faster to draw another gun than to reload (compare *Fast-Draw,* p. 81, to *Fixed Ammo,* p. 87). A pair of Deringers in the trouser pockets and a Bowie knife in the tailcoat pocket completed the ensemble of the well-dressed American gambler, lawyer, or congressman of the 1850s. John Booth assassinated President Abraham Lincoln with such a piece in 1865. More than 10,000 were made.

Deringer's name entered the English lexicon as the noun "derringer," meaning *any* concealable non-repeating pistol. Note that all Deringers are derringers, but not vice versa.

Remington Model 95 Double-Derringer, .41 Remington (USA, 1866-1934)

This tiny, break-open over-and-under pistol was the gambler's (and many a hustler's) constant companion in the late 19th and early 20th centuries. Remington made about 150,000, and other companies *still* copy it in modern calibers. The .41 Remington was an anemic round, but better than nothing in a pinch. The pistol's flat profile was ideally suited for concealment in a sleeve or boot-top, a comfort to those who cannot be conspicuously armed. It could also be concealed in a sleeve holster (p. 154) – as James West did in *The Wild, Wild West*.

The *American Derringer Model 1* (1980-) is a near-identical copy available in over 55 calibers, from .22 LR (Dmg 1d pi-, Wt. 0.6, ST 6, Rcl 2, Cost $390) and .38 Special (Dmg 2d-1 pi, Wt. 1, ST 8, Rcl 3, Cost $390), to .410-gauge 3" (Dmg 1d-3(0.5) pi-, Wt. 1, RoF 2×65, ST 7, Rcl 1, Cost $450) and .44 Magnum (Dmg 3d pi+, Wt. 1.1, ST 9, Rcl 5, Cost $530). Most modern large calibers have fearful recoil in the small-gripped, lightweight derringer.

Lancaster Howdah, .476 Enfield, (U.K., 1885-1900)

Designed for close protection of tiger hunters riding on elephants (in a *howdah* seat), this hammerless handgun had four barrels bored into a single rectangular block; other howdah pistols had only two. Its unique and fast double-action-only trigger allowed rapid fire, but reduced accuracy. The four-shot limit could be embarrassing; however, the multi-barrel rotating-lock system was nearly as malfunction-proof as a firearm could get. More reliable than a revolver, the weapon was popular with British officers in the late 19th century. The usual chambering was the contemporary British service caliber. The .476 Enfield's lead bullet had a clay wedge in the tip, which caused it to expand (treat as hollow-point, pp. 166-167).

Thompson/Center Contender, .223 Remington (USA, 1967-2000)

This accurate, single-shot, break-open target/hunting pistol fires *rifle* ammunition from a 10" barrel. It's also available in .22 LR (Dmg 1d+2 pi-, ST 10, Rcl 2), .30-30 Winchester (Dmg 4d+1 pi, ST 11, Rcl 3), .44 Magnum (Dmg 5d-1 pi+, ST 11, Rcl 4), and dozens of other calibers. Barrels of different lengths and calibers can be exchanged in less than 30 seconds. Extra barrels are $250 apiece. The Contender is often given a 0.6-lb. 2.5-7× variable scope (+2 Acc).

H&K P11, 7.62×36mm (Germany, 1976-)

This double-action underwater pistol was developed for German navy combat divers. Several European naval special-warfare units also adopted it. Top secret until the 1990s, it's almost famous today – thanks in part to Lara Croft using it in the movie *Tomb Raider 2*.

Non-Repeating Pistols Table

See pp. B268-271 for an explanation of the statistics.

GUNS (PISTOL) (DX-4 or most other Guns at -2)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
5	Wogdon Dueller, .45 Flintlock	1d+2 pi+	1	70/800	2.75/0.023	1	1(20)	9	-3	2	$300	3	[1, 2]
5	Tower Sea Service P/1796, .56 Flintlock	1d+1 pi+	1	70/800	3/0.05	1	1(20)	10	-3	3	$250	3	[1, 2]
5	MAS Pistolet AN IX, 17.1mm Flintlock	1d+2 pi++	1	50/550	2.9/0.076	1	1(20)	10	-3	3	$250	3	[1, 2]
5	Rigby Traveling Pistol, .75 Flintlock	1d+1 pi++	0	50/550	1.4/0.075	1	1(20)	10	-2	3	$300	3	[1, 2]
5	Elgin Cutlass Pistol, .54 Caplock	2d pi+	1	70/800	3/0.05	1	1(20)	10	-3	3	$300	3	[1, 2, 3]
5	Deringer, .44 Caplock	2d-1 pi+	1	50/550	0.4/0.022	1	1(20)	6	-1	3	$130	3	[1, 2]
6	Remington Model 95, .41 Remington	1d pi+	0	60/650	0.55/0.05	1	2(3i)	6	-1	2	$140	3	[2]
6	Lancaster Howdah, .476 Enfield	2d(0.5) pi++	1	110/1,200	2.7/0.2	3	4(3i)	10	-2	3	$200	3	
7	T/C Contender, .223 Remington	4d pi	3	420/2,600	3.5/0.026	1	1(3)	11	-3	3	$560	3	[2]
7	H&K P11, 7.62×36mm	1d+1 imp	1	400/1,700	2.6/1.1	3	5(5)	9	-2	2	$1,500/$75	2	[4]
8	TsNIITochMash NRS-2, 7.62×42mm	2d+1 pi-	0	110/1,200	1.4/0.053	1	1(10i)	8	-2	3	$100	2	[3]
8	Condor AM-402, 12G 2.75"	1d pi	1	35/700	1.4/0.11	1×9	1(5)	11	-2	1/10	$100	2	[2, 3, 5]

Notes:

[1] Unreliable. Malfunctions on 16+ (see p. B407).

[2] No lanyard ring (p. 154).

[3] See *Combination Weapons* (pp. 198-199) for description.

[4] Needs batteries. Second cost is for *loaded* barrel cluster. See p. 92.

[5] First Rcl figure is for shot, second is for slugs.

The P11's "silent" ammunition (p. 615) fires underwater dart projectiles (p. 169). At the weapon's maximum operating depth of 30', multiply distance to the target by 25 – not by 1,000 – to see whether it's in range (see *Firing Underwater,* p. 85). The gun's low firing signature makes it a viable alternative to a suppressed pistol even out of the water. Its electric ignition requires batteries (2×XS/5,000 shots), located in the grip. Self-illuminated sights (pp. 155-157) are standard.

The special ammunition comes as a cluster of five preloaded barrels. Once all five shots are gone, the shooter has to replace the whole barrel cluster. Clusters must be returned to the factory for reloading.

Revolvers

A revolver might employ the familiar revolving cylinder or a cluster of rotating barrels (a "pepperbox"). The earliest models use primitive mechanisms – including TL4 matchlocks and TL5 flintlocks – but revolver design doesn't really take off until the caplock appears. Many caplocks were later converted to cartridge-firing side-gate revolvers (see *Cartridge Conversions,* p. 164).

Most early revolvers are *single-action:* the hammer must be cocked before the trigger can be pulled. Mid-TL5 sees the emergence of *double-action* weapons that can be fired by trigger action alone; pulling the trigger turns the cylinder, cocks the hammer, and lets the hammer drop to fire the round. At TL6, double-actions largely replace single-actions, and *double-action-only* revolvers appear. For more on this topic, see *Trigger Mechanisms* (p. 82).

Revolvers have used a wide variety of loading schemes; see *Reloading Your Gun* (p. 86). *Caplock* revolvers are the most involved. The user must load the cylinder chambers separately with loose powder and shot (or a preloaded paper cartridge) from the front, and then prime each chamber with a percussion cap from the back.

Side-gate revolvers have a small loading gate on the side. The shooter must use the integral loading rod – mounted under the barrel – to push each empty case out through the gate. He can then insert fresh cartridges one by one.

Break-open revolvers hinge open at the top or bottom. This lets the user eject all the empty cases at once before reloading (possibly using a speedloader, p. 155).

A shooter using a revolver with a *swing-out cylinder* can swing the cylinder out of the frame and quickly dump all the empty cases at once. Then he can reload, often with a speedloader. Unless otherwise noted, the revolvers described below are double-action with swing-out cylinders.

Collier Revolver, .50 Flintlock (U.K., 1818-1825)

The Collier single-action revolver was muzzleloading, and had a flintlock action with a self-priming pan (see *Multi-Part Ammo,* p. 86). The frizzen held enough priming powder for 10 shots and automatically sprinkled it into the pan when the hammer was cocked, reducing reloading time. A tight seal between cylinder and barrel increased power and reduced fouling, backflash, chain-firing, and misfires. Only few Colliers were made.

Allen Pepperbox, .31 Caplock (USA, 1837-1864)

Pepperbox pistols are forerunners of true revolvers; instead of a single barrel, they have a barrel for each chamber. They became popular in the 1830s and were common until the 1850s, when revolvers of improved patterns quickly replaced them. This gun, designed by Ethan Allen, was a small double-action pepperbox with smoothbore barrels. Tens of thousands were made. Such weapons were popular with civilians in England and the U.S., and widely used during the California Gold Rush. Some were still in use during the American Civil War.

Dirty Tech: Improvised Guns

A gun is basically a tube, closed at one end and open at the other. The only operational necessity is that it be strong enough to resist the force of the propellant for one shot. Propellant, igniter, and projectile can all be improvised from commonly available materials.

Anybody with the Armoury or Machinist skill can make *some* kind of working gun, given suitable materials. Marsh Williams, designer of the M1 carbine (p. 113), made his first semiautomatic rifle while a prison inmate. The barrel was a discarded axle; his most complex tool, a file. The Israelis made *hundreds* of working submachine guns – mainly copies of the Sten (pp. 124-125) – during the British mandate. Old Turkish Mauser rifles provided the parts, each yielding enough for two SMGs; the only power tool used was a converted dentist's drill.

Zip-Gun

Zip-guns were a prominent part of street-gang culture in the 1950s in the U.S., in the 1970s in Northern Ireland, and in the 1990s in South Africa. A typical zip-gun is a single-shot .22 pistol. One common design uses a piece of wire-reinforced car-radio antenna as the barrel; scrap wood as the grip; a nail as the firing pin; and a rubber band as the mainspring. It suffers from poor accuracy, power, and reliability, but it *can* kill: Dmg 1d+1 pi-, Acc 0, Range 70/800, Wt. 0.5/0.0077, RoF 1, Shots 1(10i), ST 6, Bulk -1, Rcl 2. Malf. is only 12.

Finding the materials for a zip-gun takes three hours and a successful Scrounging roll. Base assembly time is eight hours – but use *Long Tasks* (p. B346) to determine how long it actually takes, rolling against Armoury (Small Arms)+2 or Machinist. The GM rolls in secret; critical failure means the gun explodes on first use, inflicting 1d cr ex damage on the user.

Colt Number 5 Holster Model, .36 Caplock (USA, 1838-1840)

Also known as the "Texas Paterson," this was the largest single-action revolver made by Colt at Paterson, New Jersey. It was called "the gun that made all men equal." The Number 5 was the first mass-produced revolver; about 1,000 were made.

To reload, the cylinder *must* be removed. Total time to detach and reinsert the cylinder is 15 seconds. Reloading the chambers follows the usual rules for caplocks – but spare cylinders ($130, 0.8 lb.) can be preloaded to save time.

The much smaller *Number 1 Pocket Model* (1837-1838), also called the "Baby Paterson," was .28-caliber: Dmg 1d-2 pi-, Acc 1, Range 40/450, Wt. 2/0.03, Bulk -1, ST 5, Cost $300. Some 500 were made.

Colt M1848 Dragoon, .44 Caplock (USA, 1848-1861)

The Dragoon was the first of Colt's truly successful revolvers. A massive gun, it was often carried in a saddle holster instead of a belt holster owing to its size (14" long with a 7.5" barrel) and weight (over 4 lbs.). It was also one of the most *powerful* black-powder handguns, with a load of powder and lead approaching that of some military rifles. More than 20,000 were made by Colt, and it was imitated in Europe and the Southern Confederacy (including Texas). Some accepted a detachable 1-lb. wooden shoulder stock (+1 Acc, -1 Bulk).

The Dragoon was preceded by the even larger Colt *M1847 Walker* (1847-1848), made at Whitneyville, Connecticut: Dmg 2d+2 pi+, Range 110/1,200, Wt. 4.7/0.15, Bulk -4, Cost $550. The Walkers – named after the former Texas Ranger who had ordered them – were made of inferior steel. Many burst in service. Any malfunction explodes the gun, inflicting 1d cr ex on the firer! A thousand were made for the U.S. Army (its first repeating handgun), and a further 100 for sale to civilians. It was license-made in Austria. Its huge size can be seen in *The Outlaw Josey Wales*.

Colt M1851 Navy, .36 Caplock (USA, 1851-1873)

This popular single-action revolver took its "Navy" nickname from the scene engraved on the cylinder, depicting a naval battle between Texas and Mexico. A large handgun – with a 7.5" barrel – it was renowned for its balance and pointability. Combined with light recoil, this made it a favorite for accurate shooting, but it wasn't notably powerful. Some 250,000 were made by Colt in the U.S. and England, and it was widely copied in the Southern Confederacy (including Georgia, Mississippi, Texas, and Virginia). "Wild Bill" Hickok carried two in a sash around his midriff.

The M1851 has a removable cylinder, which takes 15 seconds total to detach and reinsert. Reloading the chambers takes as long as usual for a caplock. Spare cylinders ($90, 0.8 lb.) can be preloaded to speed things up.

Some guns accepted a detachable 1-lb. wooden shoulder stock (+1 Acc, -1 Bulk). There was even a *hollow* stock that doubled as a 1-pint canteen! From 1875, it was common to convert the weapon to fire .38 Long Colt cartridges (see *Cartridge Conversions*, p. 164): Dmg 2d pi, Shots 6(3i).

The .44-caliber *M1860 Army* (1860-1873) was the Union Army's principal handgun during the American Civil War: Dmg 1d+2 pi+, Range 100/1,100, Wt. 2.9/0.2, ST 10, Bulk -3, Rcl 3, Cost $400. (Spare cylinders are $130, 0.9 lb.) More than 200,000 were made. From 1873, many were converted to fire .44 Colt cartridges: Dmg 2d-1 pi+, Shots 6(3i).

Beaumont-Adams Mk I, .442 Caplock (U.K., 1853-1860)

One of the first true double-action revolvers, the Adams replaced the Colt Model 1851 Navy in British service from 1855. Adams revolvers were license-built or copied in Austria, Belgium, Prussia, and the U.S. – U.S. military weapons were .36-caliber (Dmg 1d+2 pi) – and could be found almost anywhere in the world. Unlike most TL5 revolvers (p. 92), this one had a safety.

Adams revolvers were also made for a number of different metallic cartridges (see *Cartridge Conversions*, p. 164). These were side-gate loading with rod ejectors. For example, the *Adams Mk II* (1868-1872) was a direct conversion for the .450 Adams cartridge: Dmg 1d+1 pi+, Wt. 2.7/0.3, Shots 6(3i). Such weapons were British Army issue until replaced by the Webley (p. 96). Dr. Watson's "old service revolver" was probably an Adams.

Lefaucheux Mle 1854, 12×16mm Lefaucheux (France, 1854-1870)

The Lefaucheux was a side-gate loading, single-action revolver chambered for one of the first metallic cartridges, the Lefaucheux pinfire. The French navy introduced a variant in 1858. Hundreds of thousands were made for commercial sale – including copies in Belgium, France, Germany, Spain, and elsewhere. Almost 12,000 were acquired by the Union Army in 1861-1862, but mainly used in the West.

Pistol Whipping

If a foe confronts you while your pistol is empty, or you want to take him on without shooting, you can always pistol whip 'em! For most handguns, make a Brawling or DX roll to hit. Damage is thrust-1 crushing, plus the absolute value of Bulk; e.g., a Colt Government pistol (pp. 98-99) with Bulk -2 does thr+1 cr. Pistols *designed* for braining enemies – including many large, single-shot cavalry and naval pistols at TL4-5 – use the Axe/Mace skill and inflict swing+1 crushing damage.

"Unsafe" Revolvers

Most revolvers prior to the 1880s have a fixed firing pin and no internal or external safety. Uncocked, the hammer is in contact with the cartridge base. Any sharp blow on the hammer may fire it! The only safe way to carry such a revolver loaded is with the hammer resting on an empty chamber. Carrying it with *all* chambers loaded is inviting accidental discharge (see *Handling*, p. 80). Old West gunfighters supposedly kept a few greenbacks in the empty chamber – "burying money" for the gunslinger who slipped up once too often. Treat all TL5 revolvers on the *Revolvers Table* (p. 94) as "unsafe," except where noted.

Revolvers Table

See pp. B268-271 for an explanation of the statistics.

GUNS (PISTOL) (DX-4 or most other Guns at -2)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
5	Collier, .50 Flintlock	1d+2 pi+	1	70/800	2.3/0.13	1	5(10i)	10	-3	3	$500	3	[1, 2]
5	Allen Pepperbox, .31 Caplock	1d+1 pi-	1	30/330	1.8/0.04	3	6(30i)	8	-1	2	$150	3	[2, 3]
5	Colt Number 5, .36 Caplock	2d-1 pi	1	90/1,000	2.8/0.07	1	5(30i)	9	-2	2	$400	3	[2, 3]
5	Colt M1848 Dragoon, .44 Caplock	2d+1 pi+	2	100/1,100	4.2/0.14	1	5(10i)	10	-3	2	$450	3	[2, 3]
5	Colt M1851 Navy, .36 Caplock	1d+2 pi	1	90/1,000	2.9/0.14	1	6(10i)	9	-2	2	$275	3	[2, 3]
5	Beaumont-Adams Mk I, .442 Caplock	1d+2 pi+	2	100/1,100	2.5/0.11	3	6(10i)	10	-2	3	$250	3	[3]
5	Lefaucheux Mle 1854, 12×16mm	1d+2 pi+	2	100/1,100	2.3/0.3	1	6(5i)	9	-2	2	$270	3	
5	S&W Number 1, .22 Short	1d-1 pi-	2	50/550	1/0.04	1	7(5i)	7	-1	2	$280	3	
5	Girard LeMat, .42 Caplock	2d-1 pi+	2	60/700	3.7/0.16	1	9(10i)	11	-3	3	$250	3	[3]
5	Remington New Model Army, .44 Caplock	2d pi+	2	100/1,100	2.9/0.14	1	6(10i)	10	-3	3	$200	3	[3]
5	Webley RIC Number 1, .442 RIC	1d+2 pi+	1	110/1,200	2.2/0.26	3	6(5i)	9	-1	3	$350	3	[2]
5	S&W Number 3, .44 Russian	2d pi+	2	120/1,300	2.5/0.3	1	6(3i)	10	-2	3	$550	3	
5	Colt M1873 SAA, .45 Long Colt	3d-2 pi+	2	120/1,300	3/0.3	1	6(5i)	11	-2	4	$500	3	[2]
6	S&W Safety Hammerless, .38 S&W	2d-1 pi	0	90/1,000	1.3/0.17	3	5(3i)	7	-1	2	$400	3	[2]
6	Nagant R-1895, 7.62×39mmR	2d-1 pi-	2	140/1,500	2/0.25	3	7(5i)	8	-2	2	$400	3	
6	Webley-Fosbery Mk I, .455 Webley	2d-1 pi+	2	120/1,300	3/0.3	3	6(3i)	9	-2	2	$600	3	[3]
6	S&W Model 10 M&P, .38 Special	2d pi	2	110/1,200	2/0.2	3	6(3i)	9	-2	2	$500	3	[2]
6	S&W .44 Hand Ejector, .44 Special	2d pi+	2	140/1,500	2.5/0.3	3	6(3i)	10	-2	3	$600	3	
6	Webley Mk VI, .455 Webley	2d-1 pi+	2	120/1,300	2.7/0.3	3	6(3i)	10	-2	3	$300	3	
6	S&W Model 27, .357 Magnum	3d pi	2	190/2,100	3/0.2	3	6(3i)	10	-2	3	$600	3	[2]
6	S&W Model 34 Kit Gun, .22 LR	1d+1 pi-	2	70/1,400	1.5/0.05	3	6(3i)	8	-2	2	$400	3	[2]
6	S&W Model 36 Chief's Special, .38 Special	2d-1 pi	1	90/1,000	1.4/0.17	3	5(3i)	9	-1	2	$475	3	[2]
7	Colt Python, .357 Magnum	3d pi	2	190/2,100	2.9/0.2	3	6(3i)	10	-2	3	$850	3	[2]
7	S&W Model 29, .44 Magnum	3d+2 pi+	2	210/2,300	3.3/0.3	3	6(3i)	11	-3	4	$800	3	[2]
7	Charter Arms Undercover, .38 Special	2d-1 pi	1	90/1,000	1.2/0.17	3	5(3i)	9	-1	2	$350	3	[2]
8	Taurus Mod 608, .357 Magnum	3d pi	2	190/2,100	3/0.3	3	8(3i)	10	-2	3	$570	3	[2]
8	Ruger Super Redhawk, .454 Casull	5d-1 pi+	2	210/2,300	3.6/0.4	3	6(3i)	12	-3	5	$750	3	[2]

Notes:

[1] Very Unreliable. Malfunctions on 14+ (see p. B407).

[2] No lanyard ring (p. 154).

[3] Unreliable. Malfunctions on 16+ (see p. B407).

S&W Number 1, .22 Short (USA, 1857-1881)

The single-action S&W Number 1 was the first American metallic-cartridge revolver, chambered for a small round useful only at close range. It was popular as a backup gun with both officers and enlisted men during the American Civil War. Almost 260,000 were made.

To reload, the user *must* remove the cylinder. Total time to detach and reinsert the cylinder is 15 seconds. Punching out the spent cases and inserting new rounds adds five seconds per cartridge.

Between 1870 and the turn of the century, dozens of American manufacturers made hundreds of thousands of similar small-caliber revolvers. Copies such as the Hopkins & Allen Defender, Iver Johnson American Bulldog, and Merwin & Hulbert Acme were double-action, but cheap-quality only. Use the same statistics except for Malf. 16, RoF 3, and Cost $75.

Girard LeMat, .42 Caplock (France, 1861-1864)

Designed by Dr. Alexandre LeMat of New Orleans, this unusual single-action, muzzleloading revolver had a nine-round cylinder turning around an 18-gauge smoothbore shot barrel. Some 2,200 were made for the Confederacy by Girard in Paris (and another 1,000 in England) and used during the American Civil War. It can be seen in the hands of the Swede in Sam Raimi's *The Quick and the Dead.*

The hammer of the "grapeshot pistol" can be flicked (a Ready maneuver) to fire either a round from the revolver cylinder or the central barrel. The stats in the table are for the revolver barrel. The shot barrel has Dmg 1d(0.5) pi-, Acc 1, Range 30/600, RoF 1×11, Shots 1(15i), Rcl 1.

Remington New Model Army, .44 Caplock (USA, 1863-1875)

During the American Civil War, the U.S. Army adopted this single-action revolver with an 8" barrel as the M1861. It later became popular with civilians. Some 140,000 were made.

The revolver's cylinder is removable. Total time to detach and reinsert the cylinder is 10 seconds. Reloading the chambers obeys the usual rules for caplocks – but spare cylinders ($70, 1 lb.) can be preloaded to save time.

From 1871, many of these weapons were converted to fire .44 Colt cartridges (see *Cartridge Conversions,* p. 164): Dmg 2d-1 pi+, Shots 6(3i). The Preacher in *Pale Rider* carries such a gun, along with spare cylinders.

Webley RIC Number 1, .442 RIC (U.K., 1868-1892)

The Number 1 was a compact double-action, loading-gate revolver with a short barrel (3.5") to facilitate concealment. Designed for the Royal Irish Constabulary, the type soon became popular for self-protection. It was widely copied in Europe and the U.S. during the late 19th century.

Besides a solid lead bullet (in the table), it could fire an exploding SAPLE round (Dmg 1d+2 pi+ with 1d-3 [1d-2] cr ex follow-up).

The *British Bulldog Number 2* (1878-1914) had an even shorter barrel: Wt. 1.4/0.3, Shots 5(5i). It was also available in .44 Russian (Dmg 1d+2 pi+) and .450 Adams (Dmg 1d+1 pi+); the latter could chamber the .455 Webley (Dmg 1d+2 pi+) as well. Some 100,000 were made. Charles Guiteau assassinated President Garfield with a Webley Bulldog.

London's Metropolitan Police adopted a similar revolver in .450 Adams as the *M.P. Model* (1883-1884): Dmg 1d+1 pi+, Wt. 1.5/0.3. It's sometimes called the "Sherlock Holmes" pattern, as the detective is thought to have had such a gun.

S&W Number 3 Russian, .44 Russian (USA, 1871-1912)

In 1869, Smith & Wesson brought out their first big-bore revolver, the single-action Number 3 in .44 American (Dmg 2d-1 pi+). It was their earliest top-break, simultaneously extracting design. The Russian Empire adopted the gun in 1871; it fired a slightly redesigned cartridge, the .44 Russian, but the dimensions were so similar that one round would usually work in a weapon chambered for the other (see *Ammunition Interchangeability,* p. 178). The best production target pistol of its day, the Number 3 was used to set many world records. It was a favorite of "Buffalo Bill" Cody and Annie Oakley.

Smith & Wesson produced more than 206,000 Number 3 revolvers, half of which went to Russia. Other users included the Argentine army, Australian Colonial Police, Japanese navy, and Spanish army. The Turkish army adopted it in .44 Henry (Dmg 2d pi+). Copies – licensed and unlicensed – were produced in many countries. Russia made hundreds of thousands; some were still in use in WWII.

The *Number 3 Schofield* (1875-1877) was a minor variant in .45 S&W, modified according to the suggestions of Major Schofield, a U.S. Army cavalry officer: Dmg 2d-1 pi+, Wt. 2.5/0.3. Fewer than 9,000 were made. Most were used by the U.S. Army as the M1875 – especially by the "Buffalo Soldiers" of the 9th and 10th Cavalry. Obsolete in 1887, many went to the Wells, Fargo Co., which issued it with shortened barrels to its employees. Some gunfighters preferred it because it was faster to reload than most contemporary American revolvers.

Colt M1873 SAA, .45 Long Colt (USA, 1873-)

This famous single-action, loading-gate revolver has had many nicknames, including SAA (Single-Action Army), "Peacemaker," "Frontier Six-Shooter," "Thumb-Buster," and "Hog-Leg." In 1873, the U.S. Army officially adopted it to replace its hodgepodge of cartridge and caplock handguns, and used it in the Indian Wars. It was tremendously powerful for its time – and had a tremendous kick. From 1875, the Army issued the shorter .45 S&W cartridge to alleviate this: Dmg 2d-1 pi+, ST 10, Rcl 3.

The Colt SAA was manufactured in more than three dozen calibers, but the overwhelming majority of weapons were chambered for either .45 Long Colt or the Winchester rifle cartridges (allowing handgun and shoulder arm to share ammo). The .44-40 Winchester, available from 1878, was the most popular: Dmg 2d+2 pi+. Billy the Kid and his nemesis, Sheriff Pat Garrett, preferred this round.

The Colt M1873 Cavalry version in the table had a 7.5" barrel, but there were many other lengths. The next most common was the 4.75" Civilian model: Dmg 2d+1 pi+, Wt. 2.6. The Sheriff's or Storekeeper's model had a 3" barrel: Dmg 2d pi+, Acc 1, Wt. 2.5. The latter lacked an ejector rod, increasing reloading time considerably (to five seconds per round).

Although the M1873 was replaced in U.S. military service in 1892, it saw police use until the 1940s. Colt still makes the revolver for civilian shooters and enthusiasts; production has reached at least 575,000 today. There have been numerous commercial copies – modern reproductions are just as good and cost only half as much.

S&W Safety Hammerless, .38 S&W (USA, 1887-1940)

The preeminent American holdout gun of the late 19th and early 20th centuries, this was a small, top-break, simultaneously extracting, double-action-only revolver with a smooth profile. Its most common nickname was "Lemon Squeezer," since its grip safety prevented firing if the grip wasn't held firmly. It could be safely carried in a pocket (or even fired from *within* a pocket, at -2) – a trait favored by criminal and cop alike. More than 260,000 were made, plus many copies and near-identical designs.

Nagant R-1895, 7.62×39mmR Nagant (Russia, 1897-1945)

The Russian army adopted this revolver – designed by Belgium's Nagant brothers – in 1895. The weapon saw production and use through WWII, despite being officially replaced in 1930. In particular, Soviet tank crews received it instead of the Tokarev. More than two million were manufactured in Belgium, Poland, and Russia, and supplied all over Eastern Europe and Asia.

The Nagant is side-gate loading and rod-ejecting, and comes in both single- and double-action versions. The cartridge case completely covers the bullet. When the gun is fired, the cylinder moves forward and the barrel and case mate, sealing the weapon against gas loss (hence its American nickname, "Gas-Seal"). This makes it one of the few revolvers that can be effectively suppressed (pp. 158-159).

The Soviet NKVD secret police used the *Besshumnyi* (1931-1942), or suppressed version: Dam 1d+1 pi-, Range 110/1,200, Wt. 2.7/0.2, RoF 1, Bulk -3, Cost $750. Built on the single-action pattern, it had a combined baffle/wiper suppressor (-2 to Hearing, plus another -1 for being a gas-sealed revolver). It lacked an ejector rod.

S&W Model 10 Military & Police, .38 Special (USA, 1902-)

Taking into account several name changes and minor variations, this swing-out cylinder, double-action revolver was 20th-century America's most common police and security sidearm. At the height of its popularity in the mid-20th century, four in five American police officers carried it. In addition, the U.S. military issued it to Air Force pilots and ground personnel, Navy crews, and many others.

To date, more than six million weapons have been made and exported widely. Options include barrel lengths from 2" to 8", fixed or adjustable sights, differing grip layouts, and every finish from military blue to gold-plated. Since 1958, the most common version – with 4" barrel, fixed sights, and square butt – has been called the "Model 10."

The *Model 64 M&P* (1964-) is the same gun in stainless steel: Wt. 2.3/0.2, Cost $580.

The *Victory* (1942-1944) was a no-frills wartime variant used by U.S. troops. Those delivered to the British and other Allies chambered the .38 S&W: Dmg 2d-1 pi.

Speedloaders are available by the 1920s, common by the 1970s.

S&W .44 Hand Ejector, .44 Special (USA, 1908-1949)

The Hand Ejector-type double-actions made by Smith & Wesson from 1896 were the first American revolvers to allow quick emptying and reloading via a swing-out cylinder. Available in many sizes, the largest model was generally chambered for .44 Special. However, it was also available in .44-40 Winchester (Dmg 2d+1 pi+) and .45 Long Colt (Dmg 3d-2 pi+). More than 56,000 were sold commercially, and almost 80,000 were supplied to the British and Canadian military during WWI, chambered for .455 Webley (Dmg 1d+2 pi+). Indiana Jones carries one in *Raiders of the Lost Ark*.

The *M1917* (1917-1941) was a version adopted by the U.S. Army, chambered for .45 ACP (Dmg 2d pi+). Two three-round, half-moon-shaped clips were used to load the weapon, hold the rimless cartridges in the chambers, and extract the spent cases. With these, reloading takes seven seconds total. Without them, reloading takes four seconds *per chamber*.

Webley Mk VI, .455 Webley (U.K., 1915-1935)

The Mk VI was the last of the famous big-bore, double-action, break-open Webley revolvers. It was standard issue for Commonwealth troops in WWI, and still widely used during WWII. Many police forces issued it through the 1930s – notably the Royal Canadian Mounted Police. More than 300,000 were made. Indiana Jones carries one in *The Last Crusade*.

The British Army model was chambered for the smokeless .455 Webley. It could also fire the .442 RIC and .450 Adams. During WWI, some were modified to fire the .45 ACP round using three-round half-moon clips (just like the S&W M1917, above).

The first of the Webley military revolvers was the *Webley Mk I* (1887-1897), chambered for the black-powder .442 RIC. The similar *Webley Mk IV* (1899-1914) was the standard British sidearm during the Boer War. For both: Dmg 1d+2 pi+, Wt. 2.5/0.3.

The Enfield *Number 2 Mk I* (1936-1945) was based on the large Webleys but was smaller and chambered for .38 S&W: Dmg 2d-2 pi, Wt. 1.8/0.2. From 1938, it lacked a hammer spur and fired double-action-only (Acc 1). The Enfield was the standard British sidearm until 1957. It can be seen in *Sky Captain and the World of Tomorrow*.

S&W Model 27, .357 Magnum (USA, 1935-1994)

"The most powerful handgun in the world" when introduced, this weapon – renamed "Model 27" in 1957 – was a large-frame, double-action revolver with a 6" barrel, chambered for the .357 Magnum round. Until the 1990s, American police agencies often issued .357 Magnum revolvers like this one.

The .357 Magnum is a lengthened and heavily loaded .38 Special cartridge. Actual bullet diameter is 0.357". *Magnum* is Latin for "great," and often used for exceptionally powerful cartridges. The Model 27 can also fire .38 Special ammo (Dmg 2d pi, ST 9, Rcl 2), which is both cheaper and easier to handle.

The lighter *Model 19 Combat Magnum* (1955-1999) was a dedicated police weapon with a smaller frame and shorter but heavier 4" barrel: Wt. 2.5. It was also available with a 2.5" barrel: Dmg 2d+2 pi, Wt. 2.1, Rcl 5, Cost $450.

S&W Model 34 Kit Gun, .22 Long Rifle (USA, 1936-1991)

Many American outdoorsmen like to keep a "kit gun" around. This is a small revolver light enough to be part of a fishing kit or carried in a backpack or a coat pocket. Mainly intended to kill snakes, snapping turtles, and other vermin, kit guns are usually chambered for the .22 LR round. Smith & Wesson's Model 34 was typical of such weapons.

S&W Model 36 Chief's Special, .38 Special (USA, 1950-1999)

This double-action pocket revolver – built on the smallest frame available from Smith & Wesson, with a "snub nose" 1.9" barrel – was intended for individuals who typically carried a concealed firearm, such as detectives and police chiefs. Some used it as a backup gun, often wearing it in an ankle holster. Many Western police forces adopted this weapon, and it was widely copied.

The *Model 37 Chief's Special Airweight* (1952-) has an alloy frame: Wt. 1/0.17, Cost $570.

The *Model 60 Chief's Special Stainless* (1965-1996) was the first handgun made of stainless steel: Cost $590.

Colt Python, .357 Magnum (USA, 1955-1999)

When introduced, the Colt Python was probably the most prestigious handgun in America. It was renowned for out-of-the-box accuracy, being delivered as standard with adjustable target sights. It also had an intimidating psychological effect, with its heavy, vent-ribbed 6" barrel. The Python saw some police service (including with Detective Hutchinson in *Starsky & Hutch*), but was generally confined to well-off private shooters.

S&W Model 29, .44 Magnum (USA, 1955-1998)

The Model 29 was a large-frame revolver chambered for the massive .44 Magnum cartridge, made famous by Harry Callahan of *Dirty Harry* fame. It could also fire the shorter, more manageable .44 Special (Dmg 2d pi+, ST 10, Rcl 3). The standard version had a 6" barrel, but a 4" barrel (Dmg 3d+1 pi+, Wt. 3) and a huge 8.4" barrel (Dmg 4d pi+, Wt. 3.5, ST 13) were available as well. Smith & Wesson had a monopoly on .44 Magnum double-actions for a long time; from about 1965 to 1975, the Model 29 frequently sold for two to three times list price due to high demand.

The Model 29's replacement is the stainless-steel *Model 629* (1978-): Wt. 3.1, Cost $770.

Charter Arms Undercover, .38 Special (USA, 1964-1991)

With its 2" barrel and slim outline, the Undercover was an easily concealable holdout weapon of good quality.

The *Bulldog* (1973-1996) was slightly larger and bulkier. It fired the .44 Special, a round with considerably more power and recoil: Dmg 2d pi+, Range 130/1,300, Wt. 1.7/0.2, Bulk -2, Rcl 3, Cost $300. Over half a million were made.

Taurus Mod 608, .357 Magnum (Brazil, 1996-)

This large-frame, stainless-steel revolver is intended for civilian shooters. It sports an eight-round cylinder and an integral compensator.

Ruger Super Redhawk, .454 Casull (USA, 1999-)

This massive, double-action, stainless-steel revolver is designed for silhouette shooting and hunting. It has a 7.5" barrel, and comes ready to mount a targeting scope.

The *Super Redhawk Alaskan* (2005-) has a 2.6" barrel for concealed carry and supposedly enough punch to take down a grizzly bear: Dmg 4d pi+, Acc 1, Wt. 3/0.4, Bulk -2, Rcl 6, Cost $820.

Automatic Revolver

The "automatic revolver" – while usually a fictional misconception – actually exists!

Webley-Fosbery Automatic Mk I, .455 Webley (U.K., 1901-1924)

This large, double-action, break-open revolver was similar to other Webley designs (like the Mk VI, p. 96), but the entire upper part – including barrel and cylinder – recoiled back in grooves on the frame, recocking the hammer and rotating the cylinder. This lowered recoil but reduced reliability. The Fosbery wasn't a commercial success; only some 4,750 were made. A few were privately acquired by British officers prior to WWI. The weapon would certainly suit a ***GURPS Steampunk*** adventurer!

About 800 of these weapons were chambered in .38 ACP (1902-1904): Dmg 2d+1 pi, Wt. 2.4/0.2, Shots 8(3i). With an eight-round clip, reloading takes only five seconds. This version appears in both *The Maltese Falcon* and *Zardoz*.

Semiautomatic Pistols

The *semiautomatic,* or *self-loading,* pistol is a TL6 innovation that gradually replaces revolvers and all other handguns – although some older patterns continue to see service, especially in specialty niches. Early semiautomatics are somewhat unreliable, but after the teething problems are resolved, many of these pistols offer supreme reliability. Their main advantages over revolvers are greater ammunition capacity and faster reloading. They can also be made more compact.

From late TL6, and especially at TL7-8, semiautomatic pistols are the weapons of choice for the military. They gradually replace revolvers in the hands of police and law-abiding citizens, too. By TL8, revolvers are mostly confined to specialty uses and private shooters.

Semiautomatic pistols can be single-action, double-action, double-action-only, or safe-action; see *Trigger Mechanisms* (p. 82).

Mauser C96, 7.63×25mm Mauser (Germany, 1897-1943)

The single-action Mauser *Construction 1896* was the first commercially and operationally successful semiautomatic pistol, nicknamed the "Broomhandle" in America due to the shape of its grip. It was extremely widespread during the first half of the 20th century, and especially popular in Germany, Southern Europe, Russia, China (which received almost half a million), and South America. Copies and derivatives were produced in Spain and China. It can be seen in the Western *Joe Kidd* (with a stock), and forms the basis of Han Solo's blaster in *Star Wars*.

The C96 has an integral 10-round magazine loaded with a charger clip. It *can't* carry an extra round in the chamber (p. 88). The bolt closes and strips the top round off the magazine as the clip is withdrawn.

Many weapons have a detachable 1.3-lb. wooden shoulder stock (+1 Acc, -1 Bulk). This is hollow to allow the gun to be stored inside, and serves as a belt holster; it led to the Chinese nickname *he zi pao* ("boxed cannon"). Removing the pistol from within the stock takes three Ready maneuvers. Attaching the stock to the pistol takes another three seconds.

In 1908-1915, the C96 was available in 9×25mm Mauser (Dmg 3d-1 pi). In 1915-1918, many were made in 9×19mm Parabellum for war service (Dmg 2d+2 pi). A Chinese copy in .45 ACP was made in 1929-1932: Dmg 2d pi+, Wt. 3/0.5, ST 10, Rcl 3.

Beginning in 1930, Mauser offered the C96 with detachable 10-round (0.4 lb., $26) and 20-round (0.7 lb., $27) box magazines. The latter magazine stuck far below the line of the trigger guard, preventing the pistol from fitting in standard holsters. Detachable-magazine guns *can* have an additional round in the chamber.

Spanish manufacturers introduced selective-fire copies starting in 1927; Mauser made its first model in 1930. The most numerous such variant was the *C96 Schnellfeuerpistole M32* (1932-1938), which had a detachable magazine and stock: Acc 3, Wt. 4.2/0.7, RoF 14, Shots 20+1(3), ST 7†, Bulk -4, Cost $550/$27, LC2. Use the Guns (SMG) skill to shoot it. It was less controllable without the stock: Acc 2, Wt. 3, ST 8†. If fired *one-handed* without the stock: ST 10, Rcl 3. Some 70,000 were exported to China; others went to the *Waffen-SS*.

FN-Browning Mle 1906, .25 ACP (Belgium, 1906-1959)

This tiny, flat single-action pistol was chambered for a puny round, and was small enough for easy concealment in a vest or pants pocket. While short on accuracy, killing power, and reliability, and ineffective beyond a few yards, it was a popular weapon for self-defense. It was issued to high-ranking officers in some militaries – including the U.S. Army – because it was small and light enough not to wrinkle a uniform. This Browning was the second (or third, or fourth) gun of a lot of people who were more adequately armed.

More than a million were made by Fabrique Nationale alone, plus 409,000 by Colt as the *Vest Pocket* (1908-1946), which differed mainly in the markings. The gun was simple and operating stresses were low; many were built with hand tools as a cottage industry. Prior to WWII, dozens of Spanish gun makers exported cheap copies worldwide.

Disguised Firearms

Those who want to be inconspicuously armed occasionally conceal guns in everyday items. Below are some real-world examples. For a "briefcase gun," see *H&K MP5K* (p. 123).

Cane Rifle (TL5)

This hollow cane contains a barrel and a trigger mechanism. It's intended as a gentleman's protection against stray dogs and ruffians. Typically, a wooden plug protects the muzzle (the user must remove it before firing!) and reloading involves unscrewing the handle. Use Guns rifle to shoot it.

The earliest models were TL5 flintlocks. Later versions used caplock actions and then metallic cartridges; they went out of fashion at mid-TL6. A representative example is the Remington *Number 2 Rifle Cane* (1878-1886), in .32 LR: Dmg 2d-1 pi-, Acc 1, Range 110/1,200, Wt. 1.5/0.03, RoF 1, Shots 1(10), ST 8†, Bulk -4, Rcl 2, Cost $180, LC3. It had a *cork* muzzle plug that could be blown out with the bullet.

Pocketknife Pistol (TL5)

This is a pocketknife, 3" to 4" long (Holdout -1), with folding blades. The built-in gun is loaded with one round of small-caliber ammunition. Caplock models first appear at late TL5. Later versions usually fire .22-caliber rimfire cartridges. All use Guns (Pistol).

The American Novelty Co. *Defender* (1919-1929), in .22 LR, is a typical late example: Dmg 1d pi-, Acc 0, Range 70/800, Wt. 0.2/0.0077, RoF 1, Shots 1(10), ST 5, Bulk -1, Rcl 2, Cost $40, LC3.

Cigarette Pistol (TL6)

This is a single-shot gun hidden in a cigarette or a cigar. It's little more than a barrel and a firing pin. A short string in the mouth end serves as a trigger; to fire, the shooter pulls this using his fingers or teeth. The weapon is impossible to aim properly and ineffective beyond point-blank range. Roll against DX-4 to hit.

British agents during WWII employed the Welwyn *SOE Cigarette Pistol* (1943-1945), in .22 LR: Dmg 1d pi-, Acc 0, Range 70/800, Wt. 0.04/0.0077, RoF 1, Shots 1, ST 5, Bulk 0, Rcl 2, Cost $20, LC3. It couldn't be reloaded. American CIA agents used similar devices after the war.

Wrist Gun (TL6)

This is a single-shot gun mounted on a wristband. It's worn concealed under the cuff of a jacket or a blouse, with the barrel along the lower wrist. A lanyard anchors the trigger to the upper body (e.g., tied to suspenders). A sharp pull – simply jabbing the arm forward – fires the gun. It requires Guns (Wrist Gun), which defaults to Guns (Pistol) at -2 and other Guns at -4. Critical failure means the wearer shoots himself in the hand!

British agents during WWII used the *SOE Wrist Gun* (1944-1945), in .25 ACP: Dmg 1d pi-, Acc 0, Range 80/900, Wt. 0.3/0.012, RoF 1, Shots 1(10), ST 5, Bulk 0, Rcl 2, Cost $50, LC3.

The *FN-Browning Baby* (1931-1983) was similar but even smaller (Wt. 0.65).

Luger P08 Parabellum, 9×19mm Parabellum (Germany, 1908-1946)

The first Parabellum pistol designed by Georg Luger became available in 1900. It was single-action and exceptionally easy to point and shoot. Unfortunately, its toggle-joint action was susceptible to jams.

In 1900, Switzerland adopted the design in 7.65×21mm Parabellum (Dmg 2d pi-). Brazil, Bulgaria, Finland, and Portugal also introduced it in that caliber. In the U.S., it was marketed as the "American Eagle," its caliber dubbed ".30 Luger."

In 1902, a new model introduced the 9×19mm Parabellum cartridge, which eventually became the most widespread pistol caliber of the 20th century. In this chambering, the German military and police adopted it as the *Pistole 08*, which saw widespread service with German forces in 1908-1945. Export customers included the Netherlands, Persia, Turkey, and Venezuela. More than three million weapons were produced by several German manufacturers – including Mauser, who resumed manufacturing it for commercial sale in 1973.

The *LP08* (1913-1918) or *Artillerie* model had a longer barrel: Dmg 3d-1 pi, Wt. 2.9/0.5, Bulk -3. It came with a detachable 0.8-lb. shoulder stock (+1 Acc, -1 Bulk). From 1917, an oversized 32-round "snail-drum" magazine was available ($304, 2.4 lbs.); it was bulky (-1 Bulk) and reduced reliability considerably (Malf. 15). This combination was issued to machine-gun crews and assault troops. Captain Englehorn uses an LP08 in Peter Jackson's *King Kong*.

Colt Government, .45 ACP (USA, 1912-)

Designed by John Browning, this big, single-action semiautomatic was adopted by the U.S. Army as the *M1911* service pistol (1912-1925). It was improved to the *M1911A1* (1926-1970) and the *M1991A1* (1991-), although the U.S. military didn't adopt the latter. Nearly three million were made for the American armed services alone. Many other countries acquired it as well. After WWII, the U.S. supplied its allies with thousands of these weapons.

The Colt Government is probably the most extensively customized and modified gun in history. Most of these alterations – bent on improving accuracy, reliability, or reload speed – have no measurable game effects. For others, see *Firearm Quality* (p. 79). A common accessory available since the 1970s is an eight-round magazine that's no longer than the original. More exotic offerings include a 25-round extended magazine (-1 Bulk, $31, 1.8 lbs.) and a 1.1-lb. stock (+1 Acc, -1 Bulk).

Dozens of manufacturers worldwide – including in Argentina, Brazil, China, Mexico, Norway, the Philippines, and Spain – have licensed or copied the design in many calibers and sizes. Colt offers smaller versions as well. The *Commander* (1949-) has Wt. 2.6/0.5, Cost $870. The *Officer's Model* (1984-1999) has Acc 1, Wt. 2.4/0.4, Shots 6+1, Bulk -1, Cost $850.

The Colt *.38 Super Auto* (1929-) is a Government in .38 Super Auto: Dmg 3d-1 pi, Wt. 2.8/0.4, Shots 9+1, Cost $950. It was popular on both sides of the law in 1930s America,

specifically because it was able to penetrate early bullet-resistant vests (p. 66). The FBI adopted it in 1938.

The Colt *Delta Elite* (1987-1996) was a Government in 10×25mm Auto: Dmg 3d-1 pi+, Wt. 2.8/0.4, Shots 8+1, ST 11, Rcl 4, Cost $950.

The AMT *Hardballer Longslide* (1977-) is a Government with long barrel and slide, as seen in *The Terminator:* Dmg 2d+1 pi+, Acc 3, Wt. 3.3/0.5, Bulk -3, Cost $550.

The Detonics *Combat Master* (1977-1992) – a fine (reliable) weapon – was probably the smallest variant: Acc 1, Wt. 2.2/0.4, Shots 6+1, Bulk -1, Cost $1,200.

The Para-Ordnance *P14-45* (1990-2003) was a Canadian-made Government copy on a wider frame, able to accept a double-row magazine: Wt. 3.3/0.8, Shots 13+1, Cost $950/$28.

Nambu Taishou 14 Shiki, 8×22mm Nambu (Japan, 1925-1945)

Kijirou Nambu's *Taishou 14 Shiki Kenjuu* ("pistol type of the 14th year of the Taishou reign") superficially resembled the Luger (p. 98), but was completely different mechanically. This single-action pistol was the standard sidearm of the Japanese military in WWII, and also exported. Some 279,000 were made.

Walther PPK, .32 ACP (Germany, 1931-1999)

In 1929, Carl Walther introduced a then-radical design: a double-action semiautomatic that could be carried more safely than contemporary pistols. Named the *Polizei-Pistole* (PP), it was compact and overall a neat weapon, designed as a holster gun for uniformed police: Wt. 1.8/0.25, Shots 8+1. Between the 1930s and the 1970s, it was the most widespread police weapon in Europe, and was exported worldwide.

During WWII, the PP was a common sidearm of German military officers. In addition, the Nazi hierarchy gave large numbers to party members and the administration (Hitler himself carried one). After the war, it was used by the British SAS as a backup/undercover gun and issued to the royal bodyguards. It was license-made in France, Hungary, Turkey, and the U.S., and widely copied. The PP was available in other calibers, including .22 LR (Dmg 1d+1 pi-, Wt. 1.8/0.25, Shots 10+1) and .380 ACP (Dmg 2d-1 pi, Wt. 1.8/0.25, Shots 7+1).

The slightly more compact *Polizei-Pistole, Kriminal* (PPK) was a more famous – if less common – version intended for concealed carry by criminal investigators. It was the trademark weapon of James Bond. When fitted with a special threaded barrel, it accepted a 0.4-lb. sound suppressor (-2 to Hearing, -1 Bulk). The PPK was much less common in .22 LR (Dmg 1d+1 pi-, Wt. 1.5/0.2, Shots 9+1) and .380 ACP (Dmg 2d-1 pi, Wt. 1.7/0.25, Shots 6+1). It was made in elaborately engraved and decorated versions, with gold plating, pearl or ivory grips, etc.

FN-Browning High Power, 9×19mm Parabellum (Belgium, 1935-)

The single-action *Grand Puissance* ("High Power," or HP), based on a design created by John Browning before his death (1926), was introduced in 1935. It was the first of the high-capacity 9×19mm pistols. More than 70 armies worldwide adopted it, and it became the standard sidearm across the British Commonwealth. Licensed and unlicensed production has taken place in Argentina, Canada, India, Indonesia, Israel, Nigeria, and elsewhere. The HP was a favorite police and espionage weapon – its users including Vietnam-era CIA operatives and the FBI's Hostage Rescue Team during the 1980s – until it lost ground due to its single-action mechanism.

Until the 1940s, some weapons were delivered with a detachable 1.3-lb. stock (+1 Acc, -1 Bulk). An extended 20-round magazine ($28, 0.8 lb.) became available in the 1970s, and was especially popular with the British SAS.

Rocket Pistol

At TL7, designers experiment with small arms that fire miniature rockets.

MBA Gyrojet Mk I, 13×36mm Gyrojet (USA, 1965-1968)

This unique handgun fired small, spin-stabilized, rocket-propelled projectiles. It saw limited civilian sales in the U.S., but wasn't a success. Some 3,000 were made. It appeared in *You Only Live Twice.*

The Gyrojet has several advantages. With no ejector and few moving parts, it's resistant to the elements. It can fire underwater (Range 10) or drenched in mud. It's lightweight, due to low firing stresses, yet recoilless. The weapon has its drawbacks, however. The projectiles must travel some distance to reach top speed, and do *less* damage at close range. They're also inaccurate and unreliable (Malf. 16) – and early production ammo was even worse (Malf. 14).

The Gyrojet's firing signature is different from that of normal firearms: a hissing sound that's difficult to identify as a shot (use the 4-yard line on the *Hearing Distance Table,* p. 158). The internal magazine, in the grip, holds six rounds. Reloading involves inserting the rockets individually (three Ready maneuvers each). A fictional SAPHE projectile would have Dmg 3d pi+ with a 1d-2 [1d-2] cr ex follow-up.

TOZ TT-33, 7.62×25mm Tokarev (Russia, 1936-1954)

In 1930, the Soviet army adopted the single-action *Pistolet Tulskii-Tokareva obrazets 1930g* ("Tokarev's Tula-made pistol model 1930") as its new standard sidearm, replacing the Nagant revolver (p. 95). It was chambered for the 7.62×25mm Tokarev cartridge, which was patterned after the interchangeable 7.63×25mm Mauser used in the C96 (p. 97) – or "Comrade Mauser," as it was known in Russia. Modified in 1933, it was a standard handgun of Communist militaries and rebel movements during and after WWII.

The TT-33 has no safety. If carried with a round in the chamber (p. 88) and dropped or hit sharply, it may discharge. Roll 3d; it fires on 17-18.

During WWII, the Soviet secret agency SmerSh used modified specimens with a 1-lb. wiper sound suppressor (-2 to Hearing, -1 Bulk, lasts for 40 shots): Dmg 2d pi-, Range 140/1,600.

Walther P38, 9×19mm Parabellum (Germany, 1939-1946)

The P38 superseded the Luger P08 (p. 98) as the standard service pistol of the German military. It was the first high-powered, double-action semiautomatic. After WWII, French, Israeli, and East German forces, the CIA, and others used the P38. More than a million were made.

The *P38K* (1943-1945) had a cut-down barrel: Dmg 2d+1 pi, Wt. 2.3, Bulk -1. Small numbers were used by the Gestapo in WWII and by the East German Stasi in the post-war years. Production resumed in 1974-1981 – this time for West German antiterror units. Only 2,600 were made. Similar cut-down P38 pistols appeared in *The Man from U.N.C.L.E.*

The West German military adopted an improved P38 model with an aluminum frame as the *P1* (1957-1997): Wt. 2.1/0.4. It was also available commercially.

Ruger Standard MK1, .22 Long Rifle (USA, 1949-1982)

This low-cost single-action pistol was intended as a "plinker" and small-game gun. Later models included high-quality target pistols considerably less expensive than competing weapons. Millions were made.

The U.S. military adopted a variant with adjustable sights and a longer barrel for target practice: Acc 3, Wt. 2.8. Another variant was the *Standard MK2* (1982-2004): Wt. 2.7/0.4, Shots 10+1, Cost $315.

Pistols in .22-caliber are easily suppressed due to the round's low acoustic signature. Special-ops forces, mafia hit men, and other professionals have used such weapons for a long time. The Standard in particular is a favorite for conversion to a silenced assassination gun; see such movies as *Assassins* and *Collateral.* One day's skilled gunsmith work and an Armoury (Small Arms) roll can put a slide-lock (p. 161) on the bolt to make it a selective single-shot (RoF 1), and add an integral suppressor (-4 to Hearing, *including* slide-lock modifier): Wt. 2.9, Bulk -3. Such work costs about $500.

Izhmekh PM, 9×18mm Makarov (Russia, 1951-1994)

The *Pistolet Makarova* ("Makarov's pistol") was a double-action weapon based on the Walther PP (p. 99). Compact and reasonably effective, it was the issue sidearm of the Russian military and police for the second half of the 20th century. Russia made over five million. The PM was widely exported, and licensed to Bulgaria, China, and East Germany. It's still frequently encountered in the hands of revolutionary groups.

A variant used by Russian agents and special-ops units was the *PB* (1967-1994), or *Pistolet Besshumnyi* ("silenced pistol"): Dmg 2d-1 pi, Range 80/800, Wt. 2.4, RoF 1, Bulk -3, Cost $600, LC2. The integral baffle suppressor and permanent slide-lock (p. 161) give -3 to Hearing, but the weapon must be cycled after every shot.

The *PMM* (1994-) has a double-column magazine: Wt. 1.9/0.4, Shots 12+1, $250. Unlike the basic PM, it can fire +P ammo (Dmg 2d+2 pi).

H&K VP70, 9×19mm Parabellum (Germany, 1973-1984)

The *Volkspistole Modell 70* ("people's pistol model 1970") was a large-capacity, double-action-only semiautomatic. It was the first production pistol to use a synthetic frame (a TL8 feature). Less than 27,000 were made, but due to its unfamiliar appearance, it was popular in futuristic movies such as *Aliens.*

About 3,200 of these weapons accept a 1-lb. plastic shoulder stock (p. 160), which also serves as a holster. The stock features a fire selector and mechanism that transforms the VP70 into a machine pistol capable of firing three-round high-cyclic controlled bursts (p. 83). With stock: Acc 3, Wt. 3.5/0.7, RoF 9#, ST 7†, Bulk -3, LC2.

Beretta Mod 92, 9×19mm Parabellum (Italy, 1975-1980)

The Mod 92 was a well-made, double-action semiautomatic with a 15-round magazine. The Italian military and police adopted it in 1976, and it soon spread around the world. Including variants produced in Brazil, France, South Africa, Turkey, and the U.S., over three million weapons have been made.

In 1986, the U.S. military introduced the improved *Mod 92F* (1984-) as the *M9.* The 92F is also the choice of many American police agencies – and of Detective John McClane in *Die Hard.* The barrels of some military models accept a 0.4-lb., quick-detach wiper suppressor (-3 to Hearing, -1 Bulk), which lasts for 30 rounds.

The *Mod 93R* (1979-) is a machine-pistol variant offering three-round limited bursts in addition to single shots. It features an extended magazine, compensator, and folding front handgrip: Wt. 3.4/0.9, RoF 9, Shots 20+1, ST 8†, Cost $1,100/$28, LC2. It can be fitted with an optional 0.6-lb. folding stock (+1 Acc, -1 Bulk). It has been widely used in the movies.

There are many other variants, mostly minor; all have the same basic frame and action. For example, the U.S. Border Patrol (among others) adopted the double-action-only *Mod 96D Brigadier* (1991-), in .40 S&W: Dmg 2d+2 pi+, Acc 1, Wt. 2.7/0.7, Shots 13+1, Cost $700/$27.

AMT Back Up, .380 ACP (USA, 1976-1992)

This double-action pistol was so small that it could be completely concealed under an average man's hand, yet was still available in a decent caliber. It became popular as a hidden second (or backup) gun with police officers and criminals. The double-action-only *Back Up II* (1992-) replaced it.

Glock 17, 9×19mm Parabellum (Austria, 1983-)

The Glock 17 was designed for the Austrian military and police, who adopted it in 1985 as the *P80.* The manufacturers used what was then the latest technology to produce a safe-action pistol with a high-capacity magazine, controllable recoil, and light weight. Its frame and most low-stress parts are plastic, but barrel and receiver are solid steel and easily spotted by X-ray machines and metal detectors – despite early media hype to the contrary. From 1999, it comes with an integral accessory rail (p. 161) below the barrel. A common option is a 19-round magazine that's the same size as the original ($32.50, 0.7 lb.).

The *Glock 18* (1986-) is a rare selective-fire machine pistol: Wt. 2.6/1.1, RoF 21, Shots 31+1, ST 9, Bulk -3, Cost $1,000/$34, LC2. It can also use the Glock 17 magazine (Bulk -2), and vice versa.

Glocks are available in *many* calibers:

Glock 20 (1990-), 10×25mm Auto: Dmg 3d-1 pi+, Wt. 2.4/0.7, Shots 15+1, ST 10, Rcl 4.

Glock 21 (1991-), .45 ACP: Dmg 2d pi+, Wt. 2.4/0.8, Shots 13+1, ST 10, Rcl 3.

Glock 22 (1991-), .40 S&W: Dmg 2d+2 pi+, Wt. 2.1/0.7, Shots 15+1.

Glock 31 (1997-), .357 SIG: Dmg 3d-1 pi, Wt. 2.1/0.7, Shots 15+1, ST 9, Rcl 3.

Glock 37 (2003-), .45 GAP: Dmg 2d pi+, Wt. 2.2/0.6, Shots 10+1, ST 9, Rcl 3.

Slightly more compact models include:

Glock 19 (1988-), 9×19mm: Dmg 2d+1 pi, Wt. 1.8/0.5, Shots 15+1.

Glock 23 (1991-), .40 S&W: Dmg 2d+1 pi+, Wt. 1.9/0.6, Shots 13+1.

Glock 25 (1995-), .380 ACP: Dmg 2d-1 pi, Wt. 1.7/0.4, Shots 15+1.

Subcompact models, all with Acc 1 and Bulk -1, are popular as backup guns. These include:

Glock 26 (1995-), 9×19mm: Dmg 2d+1 pi, Wt. 1.6/0.4, Shots 10+1.

Glock 27 (1995-), .40 S&W: Dmg 2d+1 pi+, Wt. 1.7/0.4, Shots 9+1.

Glock 36 (1999-), .45 ACP: Dmg 2d-1 pi+, Wt. 1.7/0.4, Shots 6+1, ST 9, Rcl 3.

Most of the smaller versions can accept the magazines of their larger cousins, but this negates their Bulk advantage. A tiny 0.2-lb. wiper suppressor is available for the Glock 26 (-2 to Hearing, -1 Bulk), and lasts for 20 shots.

Glocks have spread worldwide since the 1990s. They've become the most popular handguns in American law enforcement thanks to their safe handling and low cost and weight. The Glock 22 and 23 have been the issue sidearms of the FBI and DEA since 1998, and are in service with many other U.S. and foreign police agencies. Over 2.5 million Glocks have been made.

Semiautomatic Pistols Table

See pp. B268-271 for an explanation of the statistics.

GUNS (GYROC) (DX-4 or most other Guns at -4)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
7	MBA Gyrojet Mk I, 13×36mm	3d pi+	0	1,000	1.2/0.2	3	6(3i)	6	-2	1	$1,400	3	[1, 2, 3]

GUNS (PISTOL) (DX-4 or most other Guns at -2)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
6	Mauser C96, 7.63×25mm	3d-1 pi-	2	180/2,000	2.7/0.2	3	10(3)	9	-3	2	$480	3	
6	FN-Browning Mle 1906, .25 ACP	1d pi-	0	90/950	0.8/0.2	3	6+1(3)	7	-1	2	$160/$25	3	[1]
6	Luger P08, 9×19mm	2d+2 pi	2	160/1,800	2.4/0.5	3	8+1(3)	9	-2	2	$500/$26	3	[2]
6	Colt Government, .45 ACP	2d pi+	2	150/1,600	2.8/0.5	3	7+1(3)	10	-2	3	$850/$27	3	
6	Nambu 14 Shiki, 8×21mm	2d+1 pi	2	160/1,700	2.4/0.4	3	8+1(3)	9	-2	2	$350/$26	3	
6	Walther PPK, .32 ACP	2d-1 pi-	1	120/1,300	1.7/0.2	3	7+1(3)	7	-1	2	$480/$26	3	[1]
6	FN-Browning HP, 9×19mm	2d+2 pi	2	160/1,800	2.4/0.5	3	13+1(3)	9	-2	2	$780/$35	3	
6	TOZ TT-33, 7.62×25mm	2d+2 pi-	2	180/2,000	2.1/0.4	3	8+1(3)	8	-2	2	$350/$26	3	
7	Walther P38, 9×19mm	2d+2 pi	2	160/1,800	2.4/0.4	3	8+1(3)	9	-2	2	$530/$26	3	
7	Ruger Standard MK1, .22 LR	1d+1 pi-	2	70/1,400	2.5/0.4	3	9+1(3)	9	-2	2	$300/$25	3	[1]
7	Izhmekh PM, 9×18mm	2d pi	2	110/1,200	1.8/0.3	3	8+1(3)	8	-2	2	$250/$26	3	
7	H&K VP70, 9×19mm	2d+2 pi	1	160/1,800	2.5/0.7	3	18+1(3)	8	-2	2	$550/$27	3	[1]
7	Beretta Mod 92, 9×19mm	2d+2 pi	2	160/1,800	2.8/0.5	3	15+1(3)	9	-2	2	$700/$27	3	
7	AMT Back Up, .380 ACP	2d-1 pi	1	110/1,200	1.4/0.3	3	5+1(3)	8	-1	2	$350/$32	3	[1]
8	Glock 17, 9×19mm	2d+2 pi	2	160/1,800	1.9/0.6	3	17+1(3)	8	-2	2	$600/$32	3	[4]
8	SIG-Sauer P226, 9×19mm	2d+2 pi	2	160/1,800	2.4/0.6	3	15+1(3)	9	-2	2	$840/$27	3	[4]
8	Intratec TEC-9, 9×19mm	2d+2 pi	2	160/1,800	4.5/1.4	3	36(3)	10	-4	2	$350/$30	3	[2, 5]
8	Lorcin L-25, .25 ACP	1d pi-	0	90/950	0.9/0.2	3	6+1(3)	5	-1	2	$80/$25	3	[1, 2]
8	IMI Desert Eagle, .50 AE	4d pi+	2	220/2,500	4.6/0.6	3	7+1(3)	12	-4	4	$1,250/$45	3	[1]
8	H&K USP, .40 S&W	2d+2 pi+	2	160/1,800	2.3/0.6	3	13+1(3)	9	-2	2	$770/$32	3	[4, 6]
8	TsNIITochMash SPS, 9×21mm	3d-2(2) pi-	2	160/1,800	2.9/0.7	3	18+1(3)	9	-2	2	$450/$27	3	
8	FN Five-seveN, 5.7×28mm	2d+2(2) pi-	2	170/1,700	1.7/0.4	3	20+1(3)	8	-2	2	$750/$38	3	[6]
8	Walther P99, 9×19mm	2d+1 pi	2	140/1,600	2/0.6	3	16+1(3)	8	-2	2	$610/$39	3	[6]
8	Kahr K40, .40 S&W	2d+1 pi+	1	140/1,600	1.9/0.4	3	6+1(3)	8	-1	2	$720/$37	3	[1]

Notes:

[1] No lanyard ring (p. 154).

[2] Unreliable. Malfunctions on 16+ (see p. B407).

[3] Divide damage by 3 at 1-7 yards, and by 2 at 8-21 yards. Has no 1/2D range.

[4] Very Reliable. Won't malfunction unless lack of maintenance lowers Malf. (see p. B407).

[5] Sling swivels (p. 154).

[6] Accessory rail (p. 161).

SIG-Sauer P226, 9×19mm Parabellum (Germany/Switzerland, 1983-)

This high-quality, double-action pistol is popular with law-enforcement agencies worldwide. It's also widely used by armies and special-ops forces, including the U.S. Navy SEALs and British SAS. Although it's more expensive than its competitors, it features exceptional reliability and good accuracy. Copies made in China and Iran aren't as reliable (Malf. 17). A 20-round magazine ($28, 0.8 lb.) is available starting in 1987.

In 1995, the P226 became available in .357 SIG: Dmg 3d-1 pi, Shots 13+1, ST 10, Rcl 3. The Texas Rangers adopted this version. By 1998, it was also offered in .40 S&W: Dmg 2d+2 pi+, Shots 13+1.

The *P228* (1988-1997) had a shorter barrel and grip: Dmg 2d+1 pi, Wt. 2.1/0.5, Shots 13+1. In 1992, the U.S. military adopted it as the *M11* for military police investigators, pilots, etc. Many Federal law-enforcement agencies followed suit, including the ATF, FBI, and Federal Sky Marshals – as did Jack Bauer, in early seasons of *24*.

The successor to the P228 is the *P229* (1992-), in .40 S&W: Dmg 2d+1 pi+, Wt. 2.4/0.6, Shots 12+1. In .357 SIG, the P229 has been the sidearm of the U.S. Secret Service since 1999: Dmg 3d-2 pi, Wt. 2.4/0.5, Shots 12+1, ST 10, Rcl 3.

Intratec TEC-9, 9×19mm Parabellum (USA, 1985-1994)

The infamous TEC-9 was a cheap, crude "assault pistol" with a pseudo-military look – including a large magazine in front of the trigger. It was popular with gang members. Since 1994, it has been made under various other monikers, with slight modifications (use the same stats). A shorter 20-round magazine ($28, 0.8 lb.) and an oversized, after-market 50-round magazine (-1 Bulk, $32, 2 lbs.) are available.

The TEC-9 was a prime example of a single-action design often converted to full-automatic (p. 79): Malf. 15, RoF 20!. Intratec offered a genuine selective-fire variant as the *MP-9* (1985-1989): Malf. 16, Wt. 5.3/1.4, RoF 15, LC2. This wasn't commercially successful, however.

Lorcin L-25, .25 ACP (USA, 1989-1999)

According to the ATF, this tiny pistol was one of the most common guns used in crime in America during the 1990s. It had no outstanding features other than its low price and high availability. It was a single-action weapon of low reliability and power. Available in fancy finish options – including black/gold, chrome/pearl, camouflage, and chrome/pink (the *Lady Lorcin*) – hundreds of thousands were sold to people who couldn't afford a superior gun or who didn't know any better.

IMI Desert Eagle, .50 AE (Israel, 1991-)

This gas-operated, single-action pistol appeared in the early 1980s, initially chambered for powerful revolver cartridges. Since 1991, the usual chambering has been the purpose-designed .50 Action Express. The gun has exceptional power, but is large and difficult to conceal.

Target shooters and handgun hunters sometimes use the Desert Eagle, but police and military forces shun it. Movie armorers like it for its size, however – less-massive pistols often look too small on the big screen! The Desert Eagle is finicky with its ammunition, and some shooters don't hold it firmly enough in apprehension of the recoil (a bad habit known as "limp-wristing"); both factors increase the odds of a jam. Reduce Malf. to 16 for unfamiliar shooters (p. B169).

The original version was chambered in .357 Magnum (1983-): Dmg 3d pi, Wt. 4.2/0.6, Shots 9+1, ST 10, Rcl 2. The next variant came in .44 Magnum (1986-): Dmg 3d+2 pi+, Wt. 4.6/0.7, Shots 8+1, ST 12, Rcl 4.

H&K USP, .40 S&W (Germany, 1993-)

The double-action *Universal-Selbstladepistole* ("universal self-loading pistol") is Heckler & Koch's first pistol designed for the American shooter. This popular weapon mates a modified Browning action with a polymer frame that features an integral underbarrel accessory rail (p. 161). It's respected for its reliability and accuracy.

American law-enforcement agencies prefer the .40 S&W chambering, but most military users acquire it in either 9×19mm Parabellum or .45 ACP. The former, as the *P8,* has been the standard German military pistol since 1997: Dmg 2d+2 pi, Wt. 2.1/0.5, Shots 15+1. The latter is popular with U.S. citizens: Dmg 2d pi+, Wt. 2.5/0.8, Shots 12+1, ST 10, Rcl 3, Cost $840.

The *USP Compact* (1997-) is slightly smaller and available in the same calibers. The 9×19mm version is a popular police weapon (known as the *P10* in Germany): Dmg 2d+1 pi, Wt. 2/0.5, Shots 13+1, Cost $800. Television hero Jack Bauer uses it in later seasons of *24.* U.S. Immigration and Customs Enforcement (ICE) agents are issued the Compact in .40 S&W: Dmg 2d+1 pi+, Wt. 2/0.5, Shots 12+1, Cost $800. The Compact also comes in .45 ACP: Dmg 2d pi+, Wt. 2.1/0.6, Shots 8+1, ST 10, Rcl 3, Cost $900.

The *USP Tactical* (1998-) variant has a barrel prepared for a 1-lb., quick-detach baffle suppressor (-2 to Hearing, -1 Bulk). German special-ops units adopted it in .45 ACP as the *P12:* Dmg 2d pi+, Wt. 2.5/0.8, Shots 12+1, ST 10, Rcl 3, Cost $1,100.

TsNIITochMash SPS Gyurza, 9×21mm Gyurza (Russia, 1994-)

The *Samozaryadnyi Pistolet Serdyukova* ("Serdyukov's self-loading pistol") – also called the *SR-1 Gyurza* ("Viper") – is a high-capacity, safe-action service handgun for use against armored opponents (it fires an APHC bullet). One of the first Russian pistols with a synthetic frame, it has been the sidearm of Russian intelligence services since 1996. Russian SWAT units use it as well.

FN Five-seveN, 5.7×28mm (Belgium, 1996-)

This double-action pistol was designed as a companion to the P90 PDW (p. 126), and fires the same APHC round. Several special-ops units adopted it. It has an accessory rail

(p. 161) beneath the barrel, and can be fitted with a 0.4-lb. baffle suppressor (-3 to Hearing, -1 Bulk).

Walther P99, 9×19mm Parabellum (Germany, 1996-)

This modern pistol has a synthetic frame and a hammerless action capable of double-*and* single-action operation. The grip features a replaceable backstrap that allows it to be configured for small, medium, or large hands. It has an integral accessory rail (p. 161) under the barrel. Police forces in England, Germany, Spain, Thailand, and elsewhere adopted it. It's license-made in Poland.

Fitted with an optional threaded barrel, it can mount a 0.9-lb. baffle suppressor (-2 to Hearing, -1 Bulk). Since 1998, the P99 is available in .40 S&W: Dmg 2d+1 pi+, Shots 12+1.

The *P99 Compact* (2004-) is smaller: Wt. 1.5/0.4, Shots 10+1, Bulk -1.

Kahr K40, .40 S&W (USA, 1997-)

A double-action-only, stainless-steel automatic as concealable as the Walther PPK (p. 99) but firing a *serious* round, the K40 is a popular backup or undercover cop gun.

Shotguns

Shotguns are smoothbores that most often fire *shotloads:* multiple projectiles smaller than the bore diameter. A shotshell can contain anything from a handful of large buckshot pellets for use against deer (or men) to hundreds of tiny smallshot pellets for pest control; see *Multiple Projectiles* (pp. 172-174). Shotguns can also fire *rifled slugs* – full-caliber projectiles with superior range and considerable punch. There are numerous more exotic loadings; see *Exotic Shotgun Ammo* (see box).

Shotguns appear at TL5, as fowling pieces. It's easier to hit with a cluster of projectiles than with a single bullet when shooting at a flying target such as a game bird! Hunting guns often have two barrels to improve the sportsman's odds further. At TL6, *repeating* shotguns appear, allowing quick follow-up shots against larger bird flocks. Repeaters soon become standard police weapons and even see limited front-line military use.

When firing shot, multiply out the shotgun's RoF to find the bonus for *Rapid Fire* (p. B373), as explained under *Shotguns and Multiple Projectiles* (p. B409); Rcl is 1. When firing slugs, use the RoF without the multiplier, apply the *higher* Rcl score given for the weapon, and modify Damage, Acc, and Range as described on p. 166.

Exotic Shotgun Ammo

Shotguns have an especially wide selection of possible loadings. There are many choices besides shot (p. 173) and rifled slugs (p. 166). Most are uncommon, but might prove just the ticket for adventurers . . .

APDS (p. 167). A 12G 2.75" shell with Dmg 6d(2) pi+, Acc 4, Range 150/1,600, RoF and Rcl as slug. $1.50 ($7.50 as experimental round). LC2.

APHC (p. 167). In the 1980s, a company in Italy introduced a 12G 2.75" shell with Dmg 5d(2) pi+, Acc 4, Range 100/1,200, RoF and Rcl as slug. $1 ($5 as experimental round). LC2.

Barricade-Penetrating Tear Gas (p. 171). Many police agencies use the "Ferret-12," a light tear gas shell in 12G 2.5" that penetrates doors and window panes. It has Dmg 2d-1(0.5) cr with a 4-yard-radius cloud lasting 20 seconds, Acc 3, Range 15/250, RoF as slug, Rcl as slug-1. Won't cycle in auto-loaders. $1.50. LC3.

Baton (p. 168). Most shotgun baton rounds are 12G 2.5" shells with Dmg 1d(0.5) cr, Acc 2, Range 20/250, RoF as slug, Rcl as slug-1. Won't cycle in auto-loaders. $1. LC3.

Beanbag (p. 168). Most beanbag loadings are 12G 2.5" shells with Dmg 1d(0.2) cr dkb, Acc 0, Range 10/150, RoF as slug, Rcl as slug-1. Won't cycle in auto-loaders. $1.50. LC3.

Flame Jet. Marketed as "Dragon's Breath," this 12G 2.75" shell emits a fiery cone of zirconium sparks from the muzzle (see *Area and Spreading Attacks,* p. B413). The cone is 10 yards wide at the base; Dmg 1d-2 burn, Range 75. This restricts the weapon to firing once every four seconds, as the shell continues to discharge sparks for about three seconds (this no longer counts as an attack, however) – and thus shouldn't be used from an auto-loader, which ejects the shell after firing! While available since the 1960s, such ammo hasn't entered common service, as its effectiveness is limited and it eventually ruins the shotgun's barrel. It's commercially available in the U.S. market. $1.25 ($6 as experimental round). LC3.

Frangible (p. 167). Most frangible slugs for door-breaching are 12G 2.75" shells with Dmg 5d(0.5) pi++, Acc 3, Range 50/600, RoF and Rcl as slug. $0.75. LC3.

HE (p. 169). HE shotgun shells are exceedingly rare. An Argentine company introduced a 12G 2.75" shell in the 1970s that has Dmg 4d(0.5) pi++ with a 1d-1 [1d] cr ex follow-up, Acc 4, Minimum Range 3, Range 100/1,200, RoF and Rcl as slug. $1 ($10 as experimental round). LC1.

HEAT (p. 170). HEAT shells in shotgun calibers are also rare. In 2004, the U.S. Marine Corps tested a British fin-stabilized 12G 3" design that has Dmg 1d(10) cr ex with 1d-1 cr ex linked, Acc 4, Minimum Range 3, Range 100/1,200, RoF and Rcl as slug. $2 ($20 as experimental round). LC1.

Multi-Flechette (MF) (p. 174). In 1967, U.S. Navy SEALs experimented with an MF load in a 12G 2.75" shell with Dmg 1d+1 pi-, Range 100/1,200, RoF *n*×20. $2 ($10 as experimental round). LC3.

Rock Salt. Any shotgun shell can be handloaded (p. 174) with rock salt instead of a lethal payload. This doesn't do *any* damage, and Range drops to 10, but any hit requires a HT roll to resist (with DR added as a bonus!). Failure results in "moderate pain" (p. B428). On a critical hit, the target is struck by the shot cup or wadding, for 1d-3(0.2) pi. $0.25. LC4.

Rubber Shot (p. 174). The 12G 2.5" shell adopted by the U.S. Army in 1999 has Dmg 1d-3(0.2) cr, Range 20/120, RoF *n*×18. Won't cycle in auto-loaders. $1. LC3.

Silent Shot. In 1968, the U.S. Navy tested a "silent" (p. 165) shotload in a 12G 2.75" shell with Dmg 1d(0.5) pi-, Range 30/600, RoF *n*×12. Won't cycle in auto-loaders. $5 ($25 as experimental round). LC2.

Shotguns Table

See pp. B268-271 for an explanation of the statistics.

GUNS (SHOTGUN) (DX-4 or most other Guns at -2)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
5	Tower Blunderbuss, 11G Flintlock	1d pi	2	30/600	7/0.12	1×13	1(35)	11†	-4	1/6	$200	3	[1, 2]
5	Manton Double, 16G Flintlock	1d pi	2	40/800	6.7/0.17	2×8	2(40i)	10†	-5	1/5	$1,000	3	[1, 2]
5	Colt Model 1855, 20G Caplock	1d pi	2	40/800	10.9/0.4	2×7	5(10i)	11†	-6	1/5	$800	3	[1, 2]
5	Remington Hammer Lifter, 12G 2.5"	1d+1 pi	3	40/800	7.4/0.2	2×8	2(4i)	10†	-6	1/5	$250	3	[1]
6	LeFever Automatic Hammerless, 10G 2.875"	2d-1 pi	3	40/800	10.3/0.3	2×13	2(3i)	12†	-6	1/7	$750	3	[1]
6	Winchester Model 1887, 10G 2.875"	2d-1 pi	3	40/800	8/0.6	2×13	4+1(2i)	11†	-6	1/7	$800	3	[1]
6	Winchester Model 1897, 12G 2.75"	1d+1 pi	3	40/800	8.6/0.6	2×9	5+1(2i)	11†	-6	1/5	$550	3	[1]
6	FN-Browning Auto-5, 12G 2.75"	1d+1 pi	3	40/800	8.9/0.4	3×9	4+1(2i)	10†	-6	1/4	$850	3	[1]
6	Ithaca Auto & Burglar, 20G 2.5"	1d pi	2	40/800	5/0.2	2×7	2(3i)	9†	-3	1/5	$400	3	[1, 3]
6	Ithaca Model 37 Featherlight, 12G 2.75"	1d+1 pi	3	40/800	7/0.4	2×9	4+1(2i)	10†	-6	1/5	$450	3	[1]
7	Remington Model 870, 12G 2.75"	1d+1 pi	3	40/800	7.6/0.6	2×9	5+1(2i)	10†	-6	1/5	$330	3	[1]
7	Franchi SPAS-12, 12G 2.75"	1d+1 pi	3	40/800	9.8/0.8	3×9	7+1(2i)	10†	-5*	1/4	$950	3	[1]
8	Armsel Striker, 12G 2.75"	1d+1 pi	3	40/800	10.6/1.3	3×9	12(3i)	11†	-5*	1/4	$600	3	[1]
8	Benelli M1 Super 90, 12G 3"	1d+1 pi	3	40/800	8.2/0.8	3×9	7+1(2i)	10†	-5	1/4	$1,000	3	[1]
8	Daewoo USAS-12, 12G 2.75"	1d+1 pi	3	40/800	14.2/2.1	6×9	10+1(3)	11†	-5	1/3	$1,300/$32	2	[1]
8	C-More M26 MASS, 12G 2.75"	1d+1 pi	3	40/800	3.8/1.1	1×9	5+1(3)	10†	–	1/5	$500/$34	2	[1, 4]

Notes:

[1] First Rcl figure is for shot, second is for slugs.

[2] Unreliable. Malfunctions on 16+ (see p. B407).

[3] Lacks sling swivels (p. 154).

[4] Clamps under rifle or carbine: add weight to weight of host weapon and add -1 to weapon's Bulk.

Example: Airk Heimdall shoots his sawed-off, pre-1975 Ithaca Model 37 (p. 105) as fast as he can pump. It can fire three shots per attack.

Loaded with 00 buckshot, it does 1d+1 pi damage, and has RoF 3×9 (each shot consists of nine pellets) and Rcl 1. If Airk fires three blasts of buckshot at his foe, he treats RoF 3×9 as an effective RoF 3 × 9 = 27, giving him a +5 rapid-fire bonus to hit. Since Rcl when firing shot is only 1, he scores extra hits equal to his margin of success: success by 0 means one hit, success by 1 scores two hits, success by 2 gives three hits, and so on. Airk will probably get multiple hits, but most of the 27 pellets will miss. This abstraction represents both shot spread (several yards at 1/2D and *dozens* of yards at Max) and muzzle climb due to rapid fire.

If Airk fires rifled slugs, damage becomes 5d pi++, and his shotgun has RoF 3 and Rcl 5. Three shots give *no* rapid-fire bonus. Since Rcl is 5, success by 0-4 gives one hit, success by 5-9 indicates two hits, and success by 10+ means all three slugs hit.

Tower Blunderbuss, 11G Flintlock (U.K., 1700-1840)

The muzzleloading *blunderbuss* was a short-barreled, bell-mouthed smoothbore. Sailors and civilians favored it for close defense around the turn of the 19th century. Blunderbusses were official issue to mail-coach guards in England, but their main use was to repel boarders at sea. Most European navies used similar weapons.

The bell-shaped mouth didn't spread the shot any better, but *looked* intimidating. It did make loading easier – especially on the seat of a bouncing coach or while perched on swaying crosstrees (+2 to Guns rolls to reload; see *Reloading Your Gun,* p. 86). Many blunderbusses had an integral bayonet, which folded over the barrel (Reach 1).

Manton Double, 16G Flintlock (U.K., 1797-1834)

This was an expensive weapon from one of the master gun makers of all time: John Manton, the personal gunsmith of the Royal Family of England. It had Manton's patented elevated sighting rib, waterproof locks, and rustproof platinum vents. It was exceptionally light for a muzzleloading flintlock shotgun, but paid for its light weight with increased recoil. (There's no penalty to fire both barrels simultaneously, however.)

Consider buying a Weapon Bond (p. 250) for a weapon that's custom-made for the (original) owner.

Colt Model 1855, 20G Caplock (USA, 1856-1864)

This shotgun used the muzzleloading, single-action Colt revolver design, giving the shooter five shots instead of the two available at the time from a double-barreled gun. Reloading was slow, however. While scarce (only a few hundred were made), it would make a nice new-fangled gun for an American Civil War-period adventurer.

Remington-Whitmore Hammer Lifter, 12G 2.5" (USA, 1873-1878)

This double-barreled, break-open, breechloading shotgun had exposed hammers and no ejectors. Some 5,600 were made.

Both barrels can be fired simultaneously at no penalty. The barrels are unsafe for use with TL6 smokeless propellant. Any 18 on the attack roll when using such ammo means the gun explodes, inflicting 1d cr ex on the firer.

LeFever Automatic Hammerless, 10G 2.875" (USA, 1885-1919)

This firearm was typical of the heavy, double-barreled, break-open, breechloading shotguns standard for hunters, express messengers, prison guards, and mafia assassins in

the late 19th and early 20th centuries. It was one of the first hammerless guns – and the first to feature automatic ejectors. About 18,000 were made.

Both barrels can be fired simultaneously at no penalty. The barrels on some weapons are unsafe for use with TL6 smokeless propellant. An 18 on the attack roll when using such propellant means the gun explodes, inflicting 1d cr ex on the firer.

The finer grades fit their owner better – consider buying a Weapon Bond (p. 250) – and last longer. These are usually engraved and otherwise decorated. See *Styling* (p. 10).

Winchester Model 1887, 10G 2.875" (USA, 1887-1899)

This gun was a favorite of market hunters and riot-quellers in the late 19th and early 20th centuries. Its four-shot tube magazine – plus one in the chamber – gave more fumble-free firepower than a double-barreled weapon, and the lever action was familiar to Americans from the long line of Winchester lever-action rifles. Both long- and short-barreled (30" and 20") versions were available; the latter had Wt. 7.5, Bulk -5. Almost 65,000 were made, including some in 12G 2.75" (Dmg 1d+1 pi, RoF 2×9).

The barrel isn't safe for TL6 smokeless propellant. An 18 on the attack roll when using such ammo means the gun explodes, inflicting 1d cr ex on the firer.

The *Model 1901* (1901-1920) was the same gun designed for modern smokeless ammo. Some 13,500 were made. Such a gun is used in *Terminator 2* – complete with the One-Armed Bandit perk (p. 249).

Winchester Model 1897, 12G 2.75" (USA, 1898-1957)

The Winchester "trombone action" is the most famous slide-action shotgun in history. It lacked a disconnector – it could be fired by keeping the trigger pressed and pumping the action, increasing RoF to 3×9. Over a million were made, and it's copied in China even today.

The Model 1897 was produced in every grade from military plain to elaborately engraved and mounted. The basic goose gun had a 30" barrel, while the standard riot gun had a 20" barrel (Wt. 7.4, Bulk -5). Either was available as a take-down model, resulting in a package less than 2' long when disassembled (Holdout -3, Cost $600). The weapon also came in 16G 2.75" (Wt. 8/0.45, RoF 2×8). The U.S. military used a version of the Model 1897 as a trench gun in both World Wars; this had a 20" barrel (Wt. 8.8, Bulk -5) and could mount the M1903 rifle's 1.1-lb. sword bayonet (Reach 1).

FN-Browning Auto-5, 12G 2.75" (Belgium, 1903-1998)

The Auto-5 was the first auto-loading shotgun, designed by John Browning and originally manufactured by Fabrique Nationale. It had lower felt recoil than most shotguns – the action's operation absorbed some of the energy involved. FN alone made more than three million guns. Between these and various copies, the weapon is likely to show up anywhere in the world.

While intended primarily for hunting, the Auto-5 saw use in both World Wars. The riot/military model had a shorter, 20" barrel: Wt. 8.4, Bulk -5. The British SAS favored this version for jungle warfare in Burma and Malaysia during the 1950s and 1960s.

The Remington *Model 11* (1905-1948) was a licensed copy. Both the Auto-5 and Model 11 were available in 16G 2.75" (Wt. 8.4/0.4, RoF 3×8) and 20G 2.75" (Wt. 7.9/0.3, RoF 3×7). Remingtons with barrel and stock sawed off (Acc 2, Wt. 5.7/0.4, ST 12†, Bulk -4, Rcl 1/5) were favorites of Bonnie and Clyde.

Ithaca Auto & Burglar, 20G 2.5" (USA, 1922-1934)

A factory-made sawed-off shotgun, this hammerless, double-barreled "whippet" gun had short barrels, no stock, and a pistol grip. It could be worn in a holster or carried under a coat. Aimed at the police market, it was also offered commercially for home protection and dispatching road kills. Some 7,000 were made.

Due to the weapon's muzzle blast, Hearing and Vision roll to locate it firing in the dark are at +1. Both barrels can be fired simultaneously at no penalty. If used *one-handed:* ST 11. The load in the table is buckshot, but a smaller load would be more common: Dmg 1d(0.5) pi-, Range 30/600, RoF 2×20.

Ithaca Model 37 Featherlight, 12G 2.75" (USA, 1937-)

This lightweight pump-action shotgun is unique in that it ejects spent shells *downward,* not to the side. A popular hunting gun, it has also seen considerable service in the hands of American police officers, especially with the LAPD and NYPD. Specimens made before 1975 lack a disconnector – they can be fired by keeping the trigger pressed and pumping the action, increasing RoF to 3×9. The weapon is also available in 20G 2.75" (Wt. 6.1/0.35, RoF 2×7).

The *Model 37 M&P* (1967-), with riot barrel and extended magazine, was popular with U.S. Navy SEALs in Vietnam: Wt. 7.3/0.8, Shots 7+1, Bulk -5.

The pistol-gripped *Model 37 Stakeout* (1981-1987), with "whippet" barrel and no stock, was designed for "close encounters": Acc 2, Wt. 5.4/0.4, ST 12†, Bulk -3, Rcl 1/6. It appears as a backup weapon in the movie *Aliens.* Detective Tubbs in *Miami Vice* carried a custom-built gun with a further cut-down barrel and a folding foregrip: Acc 2, Wt. 4.5/0.2, Shots 2+1, ST 12†, Bulk -3, Rcl 1/6. The Stakeout was also chambered in 20G 2.75": Acc 2, Wt. 3.8/0.35, RoF 2×7, Shots 4+1, ST 11†, Bulk -3, Rcl 1/6.

Remington Model 870 Wingmaster, 12G 2.75" (USA, 1950-)

In 1950, Remington introduced an improved pump shotgun that rapidly became the best-selling scattergun of all time. The Model 870 has an exceptionally smooth and reliable action, good handling, and a moderate price. It's the overwhelming choice of police and security agencies worldwide – and the old standby of many duck and turkey hunters. Such a gun would be the one most likely to ride in the gun rack of a 20th-century American police cruiser or hunter's pickup. More than eight million have been made, and it's copied in China.

The Sawed-Off Shotgun

Contrary to popular myth, shortening the barrel(s) of a shotgun *doesn't* improve hit probability or damage at all. The practice serves primarily to render the weapon more compact. Hunting guns have long barrels, making them unwieldy in combat – and if you want to conceal one under a coat or wear it in a holster, removing the stock makes sense, too. Sawed-off double-barrel scatterguns *are* more handy on the seat of a stagecoach (the origin of the term "riding shotgun") or in a belt holster!

On a double-barreled shotgun, cutting the barrels down from a normal hunting length of 26-32" to a "riot gun" or "trench gun" length of 18-20" removes -1 from the Bulk penalty. Weight drops by 1 lb., too. The barrels can be cut even shorter, to a "whippet" configuration of 8-12"; this removes -2 from Bulk and lowers weight by 2 lbs., but increases muzzle blast (+1 to Hearing and Vision rolls to locate it firing in the dark).

On a single-barreled repeating shotgun with a tube magazine under the barrel, the barrel can only be sawn off to the end of the magazine. Weight drops by 0.75 lb. Bulk is unchanged.

On *any* type of shotgun, sawing off the shoulder stock removes -1 from Bulk and lowers weight by 1 lb. It also reduces Acc by 1. Multiply ST by 1.2 (round to the nearest whole number) and increase Rcl by 1 (but not if Rcl is 1). A folding stock (p. 160) may be more useful.

These effects are cumulative. In some times and places – notably the U.S. from 1934 – such modifications will also lower the gun's LC from 3 to 2.

Example: At the O.K. Corral in 1881, "Doc" Holliday carried a Belgian Meteor 10G 2.875" double-barrel – similar to the LeFever (pp. 104-105) – in "whippet" configuration. The original gun, with 32" barrels, had Acc 3, Wt. 10.3/0.3, ST 12†, Bulk -6, and Rcl 1/7. With cut-down barrels and stock, it has Acc 2, Wt. 7.3/0.3, ST 14†, Bulk -3, and Rcl 1/8.

From 1985, it comes with a 3" chamber as standard, allowing it to fire 3" shells (Dmg 1d+2 pi, RoF 2×12, Shots 4+1) as well as 2.75" ammo. It's also made in 20G 2.75" (Wt. 7/0.45, RoF 2×7). As sold off the rack at a sporting goods store, the magazine is plugged to take only two rounds (plus one in the chamber) due to U.S. hunting laws. The plug is easily removed; this requires five minutes and an Armoury (Small Arms) or IQ-based Guns (Shotgun) roll.

The *Model 870P* (1969-), designed for police service, has a shorter barrel and an extended seven-round magazine: Wt. 8.3/0.8, Shots 7+1, Bulk -5, Cost $400. An optional folding stock, available from 1972, gives Bulk -5*. This weapon is also offered in "cruiser" configuration, with a 14" barrel, *no* stock, and a pistol grip: Acc 2, Wt. 6.7/0.4, Shots 4+1, ST 12†, Bulk -3, Rcl 1/6.

The KAC *Masterkey* (1992-) is a cut-down variant, mounted on a rail (p. 161) under the barrel of an assault rifle or carbine: Acc 2, Wt. 6/0.3, Shots 3+1, Cost $1,900, LC2. It adds -2 to the host weapon's Bulk.

Franchi SPAS-12, 12G 2.75" (Italy, 1979-1994)

Designed from the outset for police and military use, but confusingly called the "Sporting Purpose Automatic Shotgun, 12-gauge" the SPAS-12 could function as either a gas-operated semiautomatic or, at the touch of a button, a pump-action shotgun. This allowed it to use any 12-gauge shell that fit its chamber – even if the load wasn't powerful enough to cycle the action (such as 12G 2.5" ammo and many of the less-than-lethal rounds under *Exotic Shotgun Ammo,* p. 103). A folding stock came standard, but it was also available with a fixed stock (Bulk -5).

The SPAS-12 is still in service with several European and South American military and police forces.

Armsel Striker, 12G 2.75" (South Africa, 1983-1989)

Intended as a riot and home-defense gun, the Striker fired semiautomatically, feeding from a revolving cylinder with a loading gate. A clockwork spring turned the cylinder. Reloading was slow (three Ready maneuvers to put each round in its chamber, plus two more Ready maneuvers to wind the spring). The weapon had a 12" barrel and a folding stock.

Several U.S. producers manufactured this shotgun under license as the *Street Sweeper* (1986-1994). This version had an 18" barrel to comply with American laws: Wt. 11/1.3, Bulk -5*, Cost $2,000.

In South Africa, the externally similar Reutech *Protecta* (1989-2004) replaced the Striker in production. This weapon automatically ejected spent cases and did away with the clock spring (skip the two seconds to wind it when reloading), instead using a pump-action mechanism to turn the cylinder. The Protecta was available with a 12" barrel (treat as Striker but with RoF 2×9) and an 18" barrel (treat as Street Sweeper but with RoF 2×9), and as the *Protecta Bulldog,* with a 7.5" barrel and no stock: Acc 2, Wt. 6/1.2, RoF 2×9, Shots 11, ST 10†, Bulk -3, Rcl 1/6, Cost $1,500, LC2. Due to the Bulldog's muzzle blast, Hearing and Vision rolls to locate it firing in the dark are at +1. It can be seen in the movie *Desperado*.

Benelli M1 Super 90, 12G 3" (Italy, 1984-2005)

The Super 90 is a recoil-operated semiautomatic shotgun, famous for reliability and fast handling. It features a full stock with a pistol grip. The weapon can fire both normal 2.75" shells (in the table) and longer 3" Magnum loads (Dmg 1d+2 pi, RoF 3×12, Shots 6+1). It's widely used by police units and antiterrorist teams.

The *M1 Super 90 Entry* (1992-2004) had a short (14") barrel: Wt. 7.2/0.6, Shots 5+1, Bulk -4, Cost $1,100.

The *M3 Super 90* (1989-) can be switched to pump-action mode (RoF 2×9) when using low-powered ammunition (see *Exotic Shotgun Ammo,* p. 103): Wt. 8.3, Cost $1,170. The *M3T Super 90* (1990-) is similar, but has a folding stock: Wt. 8.6, Bulk -5*, Cost $1,170.

The *M4 Super 90* (1999-) is gas-operated but operationally identical to the externally similar M1: Wt. 8.3/0.7, Shots 6+1, Cost $1,470. In 2002, it entered service with the U.S. military as the *M1014.* The M1014 has a telescoping stock and integral rails (p. 161) for a sight.

Daewoo USAS-12, 12G 2.75" (South Korea, 1987-)

The "Universal Sporting Automatic Shotgun, 12-gauge" (USAS-12) is anything but a sporting gun. It's a gas-operated, selective-fire shotgun externally resembling an oversized M16 assault rifle. Based on prototypes developed by Maxwell Atchisson in the 1970s, it's produced mainly in South Korea – although several U.S. manufacturers have tried to market it. More than 30,000 have been made, most as semiautomatics (RoF 3×9, LC3). Military sales have been scarce. The USAS-12 feeds from a 10-round box magazine, but can also use a 20-round drum ($264, 4.6 lbs.) which adds -1 to Bulk.

C-More M26 MASS, 12G 2.75" (USA, 2003-)

The Modular Accessory Shotgun System (MASS) mounts under the barrel of an assault rifle or carbine via an accessory rail (p. 161). It has a straight-pull bolt action and a detachable magazine. In addition to the door-breaching frangible slugs (p. 167) most commonly loaded, the M26 can fire lethal and less-than-lethal rounds.

Muskets and Rifles

Both *muskets* and *rifles* are long-barreled firearms fired from the shoulder. The difference is in the barrel: a musket is a smoothbore, while a rifle uses a grooved (*rifled*) barrel that improves accuracy and power. Together, these long arms are the main TL5-8 infantry and sporting weapons.

At TL5, the earlier muzzleloading musket coexists with the muzzleloading rifle until the rifle's higher power, accuracy, and range retire the musket. Breechloading rifles – quicker to reload, and more convenient – are perfected by late TL5. Early manual repeating rifles, using a variety of actions, also appear late in the TL.

At TL6, the manual repeating rifle is perfected. Semiautomatics follow, and then automatic rifles that offer both single shots and full-automatic fire. At TL7, this leads to the *assault rifle* – a weapon similar to the automatic rifle that fires an intermediate- or small-caliber round with less power and range but reduced recoil and weight. Assault rifles are the standard military shoulder arms of TL8, but many older actions and designs are still manufactured.

Carbines are a subclass of muskets and rifles. They feature shorter barrels than comparable shoulder arms, and sometimes fire less-powerful ammunition. They're intended for cavalry, artillery crews, sailors, and (at TL6-8) airborne and vehicle troops. From mid-TL7, the *assault carbine* – a short-barreled assault rifle – starts to replace the submachine gun (pp. 122-126) in many applications.

Kentucky Rifle, .45 Flintlock (USA, 1740-)

"Kentucky rifles" were originally made by Pennsylvanian gunsmiths and named after the unsettled area west of the Appalachians – then called "Kentucky" – where hunters and pioneers often took the guns. Similar weapons were made all over English-speaking North America. They were mostly replaced by the 1840s, but manufacture continues even today for hobby shooters.

The Kentucky rifle was a long-range hunting and defensive weapon adapted from German and Swiss patterns to meet the specific conditions in 18th-century North America. These demanded a rifle with a smaller caliber, longer range, and quicker follow-up shots. The barrel was lengthened to increase power and give a greater sight radius for more accurate long-distance shots. Speedier reloading was accomplished via the greased patch – which wasn't as precise as using a mallet and rod to force the ball into the grooves, but much faster – and most guns had a small brass box with a spring-loaded lid inset in the stock to hold patches. Relative to period muskets, the rifle's slow reloading speed and lack of a bayonet made it less effective in front-line use, but it was popular with military scouts and marksmen.

> *. . . and as to firing at a man at 200 yards with a common musket, you may just as well fire at the moon . . .*
>
> *– Colonel George Hanger, article from 1814*

Brown Bess, .75 Flintlock (U.K., 1744-1797)

Officially called the Short Land Pattern Musket due to its "short" 42" barrel, this smoothbore flintlock was also known as the "Tower Musket" – or, most commonly, as the "Brown Bess" (after its browned finish). It was introduced in 1744 as a dragoon "carbine" before it became the standard British service arm in 1769. Minor variants saw use until the 1840s, including in the American Revolution. Hundreds of thousands were made, and copies were manufactured worldwide; the British Army also bought it from Belgian and German makers.

Even compared with contemporary weapons, the "Brown Bess" was heavy and expensive, and had poor range and accuracy. It took a 1.1-lb. socket bayonet (Reach 1, 2*).

North West Gun, .50 Flintlock (U.K., 1770-1870)

"North West Gun" was a generic name for the "trade guns" sold to Native Americans between the late 18th and late 19th centuries. These were cheap flintlock muskets with relatively short barrels. Most came from England – these were strongly preferred by the Indians – but many were also produced in Belgium and America.

Charleville Fusil Mle 1777, 17.5mm Flintlock (France, 1777-1839)

The *Fusil d'Infanterie Modèle 1777* ("infantry musket model 1777") was the standard musket in service with the French military during the late 18th and early 19th centuries. At 4.8' (6.2' with bayonet), it was the longest infantry firearm of its day. During the American Revolution, Washington's Continental Army received large numbers of an earlier but similar version, the *Mle 1766* (1766-1777). The *Mle 1777 AN IX,* a version modified in 1801, saw service in the Napoleonic Wars. Some seven million of the Mle 1777 ultimately spread across Europe, and countries such as Austria, Prussia, Russia, and the U.S. based their own muskets on the design.

The Mle 1777 took a 0.6-lb. socket bayonet (Reach 1, 2*). Its Malf. 15 reflects the low-quality gunpowder used by the French military until 1817. Better powder improves Malf. to 16.

Baker Rifle, .625 Flintlock (USA, 1800-1823)

Designed by gunsmith Ezekiel Baker, this successful flintlock rifle was issued by elite rifle units in the British Army, including the 60th (Royal American Rifle) Regiment and the 95th (Rifle) Regiment. More than 30,000 were made, and it was also exported to Portugal and Spain. It saw service during the Napoleonic Wars as well as in North America. As the British replaced it from 1837, surplus weapons spread worldwide – the Mexican army used the Baker at the Battle of the Alamo. It can be seen in action in the TV series *Sharpe's Rifles*.

The Baker took a 2-lb. sword bayonet (Reach 1, 2*) with a full knucklebow (counts as brass knuckles).

Hall M1819, .54 Flintlock (USA, 1819-1842)

Made at Harper's Ferry Arsenal for the U.S. Army, the Hall breechloading rifle was used in the Mexican and Indian wars. It didn't replace the muzzleloader in service because it was expensive to make and easy to break, and had no effective breech seal. Only 19,680 were made.

The Hall took a 0.7-lb. socket bayonet (Reach 1, 2*). Its entire breech mechanism – including trigger and hammer – could be removed as a unit and fired using Guns (Pistol). This was a popular "off-duty" sidearm with some troops . . . Since it lacked grip, sights, and barrel, it was terribly inaccurate: Dam 1d+2 pi+, Acc 0, Range 40/450, Wt. 1.2/0.044, RoF 1, Shots 1(5), ST 10, Bulk -1, Rcl 6.

Dreyse M.1841, 15.43×54mm Dreyse (Prussia, 1841-1870)

Nicolas Dreyse's *Zündnadelgewehr Modell 1841* ("rifle with firing needle model 1841") was the Prussian service rifle in 1848-1871 – although *production* began earlier, in 1841. The Prussians used this weapon to suppress several German revolutions, as well as in war against Denmark (1864), Austria (1866), and France (1870). More than 600,000 were made, and from the late 1870s until the turn of the century, it was available cheaply as surplus in Europe.

The M.1841 was a single-shot, bolt-action gun that featured a transition technology between muzzleloaders and metallic cartridge breechloaders. All bolt-action rifles can be traced back to it. It was the first of the so-called "needle guns," which had long, needle-like firing pins to penetrate the combustible paper case and strike the percussion cap at the base of the bullet. Its low Malf. is due mainly to this pin being prone to breakage. A malfunction (p. B407) most often indicates a mechanical problem.

The M.1841 took a 0.7-lb. socket bayonet (Reach 1, 2*).

Enfield P/1853, .577 Caplock (U.K., 1853-1866)

The Enfield Rifled Musket Pattern 1853 was Britain's standard rifle until the adoption of cartridge breechloaders. The P/1853 was standard issue in the Crimean War. It was sold all over the world, and most European nations adopted similar weapons. Both sides in the American Civil War used hundreds of thousands of Enfields.

Besides standard Minié bullets (in the table), the P/1853 fired SAPLE (Dmg 3d+2 pi+ with a 1d-2 [1d-1] cr ex follow-up) and multiball (Dmg 1d+1 pi, Acc 2, Range 50/550, RoF 1×3, Rcl 1). It took a 0.8-lb. socket bayonet (Reach 1, 2*).

Drilling

The *drilling* ("triplet"), invented in 1891, became the customary hunting weapon of Central Europe during the early 20th century. It traditionally consisted of a double-barreled, side-by-side shotgun with a rifle barrel underneath, but some variants featured two rifle barrels and a single shotgun barrel, three identical barrels, or even guns of three different calibers! A drilling allowed a hunter to carry a single gun yet be prepared for widely different game.

Sauer Modell 30

The Sauer M30 is a typical German drilling. It was made in 1930-1944. It has twin 12G 2.5" barrels (Dmg 1d-1(0.5) pi-, Acc 3, Range 20/350, RoF 2×109, Shots 2(3i), ST 10†, Rcl 1/5) with a 9.3×74mmR barrel below (Dmg 7d+2 pi, Acc 5, Range 1,000/4,400, RoF 1, Shots 1(3i), ST 10†, Rcl 5). It weighs 7.8 lbs. loaded, has Bulk -5, costs $2,000, and is easily disassembled (Holdout -3).

In 1941-1942, some 2,500 of these weapons were acquired as survival guns for *Luftwaffe* aircraft (p. 237) – primarily for those operating over North Africa. The drilling was issued in a gun case (p. 160) that weighed 32 lbs. filled, including 20 rifle rounds, 20 shotgun slugs, and 25 shotshells.

TOZ TP-82

The *Tryekhstvolniy Pistolet obrazets 1982g* ("three-barreled pistol model 1982") is a survival weapon designed for Russian cosmonauts. The Soviet air force introduced it in 1985 to be carried on spacecraft, long-range bombers, and reconnaissance aircraft.

The TP-82 has twin 32G barrels (Dmg 1d-2(0.5) pi-, Acc 2, Range 15/300, RoF 2×76, Shots 2(3i), ST 9†, Rcl 1/3) with a 5.45×39mm barrel below (Dmg 4d pi, Acc 3, Range 390/2,700, RoF 1, Shots 1(3i), ST 8†, Rcl 2). It weighs 3.9 lbs. loaded, has Bulk -3, and costs $750. It has a pistol grip (if fired *one-handed:* ST 11, Rcl 3), but it's designed to be fitted with a detachable 1.8-lb. shoulder stock (+1 Acc, -1 Bulk). This stock is actually a 1.4-lb., triangular machete (p. 197) in a 0.4-lb. sheath. The TP-82 is issued in a 7.5-lb. kit with stock, pistol belt, 11 hollow-point rifle rounds, 10 shotshells, and five red flare shells (burn 10 seconds).

The .58-caliber *Springfield M1858* (1858-1866), standard U.S. Army issue, was so close a copy that ammunition was interchangeable.

In 1866, the British Army decided to convert their Enfield muzzleloader into a metallic cartridge breechloader, using a conversion devised by Jacob Snider (see *Cartridge Conversions,* p. 164). This was the *Snider Pattern I* (1866-1873) in .577 Snider: Dmg 4d+1 pi+, Range 200/2,200, Wt. 10/0.1, Shots 1(3). Some 815,000 were made. Although soon superseded by the Martini-Henry (pp. 109-110), the Snider remained in service with colonial forces for quite some time, and many weapons found their way to other users – some forces in Africa still used it in 1940! It was standard issue until the 1880s in Japan, where it was known as the *Sunaidoru-juu* ("Snider gun").

Volcanic Repeating Rifle, .38 Volcanic (USA, 1855-1860)

This was one of the first lever-action repeating firearms, and the direct ancestor of the famous rifles later introduced by Winchester (see *Winchester Model 1873,* p. 110). Developed by Messrs. Smith and Wesson, it fired a "rocket ball" cartridge that was a curious hybrid: self-contained but completely caseless, with the propellant and percussion cap in a hollow in the base of the bullet. Ammunition was loaded in a tubular magazine below the barrel. However, the Volcanic wasn't a very good gun – it was inaccurate, underpowered, and clumsy to handle. Fewer than 2,000 were made.

Spencer M1860, .56-56 Spencer (USA, 1863-1865)

The Spencer was the first *successful* repeating rifle. It was used in considerable numbers during the American Civil War, as well as by civilians; many veterans bought their issue weapons with their last month's pay. Some 48,000 M1860 carbines were made. The gun features prominently in Clint Eastwood's *Unforgiven.*

The M1860 had a detachable tube magazine in the wooden butt, from which the cartridges were loaded into the chamber by operating the trigger-guard lever. The external hammer had to be cocked before each shot. Preloaded tubes could speed reloading (five Ready maneuvers to reload, or three seconds per cartridge to top up a tube). At 11" in length, the 0.6-lb. Blakeslee loaders were fairly unwieldy and usually carried in a purpose-designed case holding six or 10.

The *M1865* (1865-1867) was chambered for the .56-50 Spencer (still Dmg 3d+2 pi+). It allowed the shooter to load a round directly into the chamber, keeping the magazine in reserve. Some 61,000 were produced. The M1865 became the main weapon of U.S., French, and Japanese cavalry in the 1860s and 1870s.

Remington Number 1 Rolling Block, .45-70 Springfield (USA, 1868-1903)

The Remington Rolling Block was a target rifle of the highest quality for the late 19th century, and very much a specialist's weapon – professional buffalo hunters often used it, in a variety of calibers. It came with fragile but precise micrometer sights (or a scope); some also had double set triggers. About 10,000 were made.

Minié Balls

The principal drawback of the muzzleloading rifle for military service is its slow loading speed. The bullet has to fit the bore tightly in order to take the rifling. However, a tight-fitting ball is difficult to load – especially in a bore fouled by firing.

In 1847, French army officer Claude-Étienne Minié invented a hollow-based, conoidal bullet. It was smaller than the bore for quicker and easier loading (see *Reloading Your Gun,* p. 86). In the hollow base was a clay plug. The pressure of firing forced the plug into the base, expanding the lead to take the rifling. It was later shown that the plug was unnecessary – the propellant gases alone were sufficient to expand the base.

Minié bullets – invariably called "minny balls" in America – were the standard solid projectiles in the great mid-19th century wars (Crimean War, Franco-Austrian War, American Civil War, and Indian Mutiny). However, its battlefield reign was short. Many armies adopted it in the early 1850s, but replaced it by the 1870s when new cartridge breechloaders appeared.

The *Number 1 Long Range Creedmoor* (1874-1891) was a more powerful version, in .44-90 Remington Special: Acc 5, Range 600/3,600, Wt. 10.6/0.12, ST 11†, Cost $1,750. A fine (accurate) weapon, only 500 were made.

The *Number 10* (1877-1934) was one of several shotgun versions, chambered for a 12G 2.5" black powder shotshell: Dmg 1d+1 pi, Acc 3, Range 40/800, Wt. 7/0.1, RoF 1×8, Rcl 1.

More common than these hunting guns were Remington Rolling Block *military* rifles. Over a million were made and widely exported until WWI. Many countries produced them under license. Surplus Rolling Block military rifles were popular with hunters and irregular forces up to the mid-20th century. Calibers included 11.15×58mmR Spanish Remington (Dmg 4d+1 pi+), common in Latin America as well as in China, and 11.4×50mmR Egyptian Remington (Dmg 4d+1 pi+), popular in North Africa.

Martini-Henry Mk I, .450 Martini-Henry (U.K., 1871-1876)

This heavy, breechloading, single-shot rifle saw extensive use during the late 19th century. The British military adopted it in 1871 and issued it widely from 1874, in several versions. Some were used into the 20th century. It can be seen in the film *Zulu.*

In operation, a lever below the stock tilted the breechblock upward, ejecting the empty case and allowing insertion of a fresh cartridge. This round was the much-maligned .450 Martini-Henry, which had a case built up from rolled pieces, making it vulnerable to case ruptures and jams. On a malfunction (p. B407), a stoppage means a stuck case that must be pried out with a knife or a screwdriver, taking *six* Ready maneuvers.

From 1885, a shotload was available for colonial use: Dmg 1d(0.5) pi-, Range 35/700, RoF 1×11, Rcl 1.

The Martini-Henry took a 1.1-lb. socket bayonet (Reach 1, 2*).

The *Greener-Martini Mk II* (1922-1998) was a light harpoon gun for hunting large fish and walrus. It fired a barbed, 0.6-lb. harpoon ($175 each) from the muzzle using a .38 blank: Dmg 6d imp, Acc 2, Range 35/120, Wt. 13.1/1.6, RoF 1, Shots 1(45), ST 11†, Bulk -6, Rcl 4, Cost $2,000. The harpoon was attached to a 35-yard, 1/4" line (3.25 lbs.) capable of supporting 300 lbs.

Springfield M1873, .45-70 Springfield (USA, 1873-1878)

This breechloader was commonly known as the "Trapdoor" due to its hinged breechblock mechanism. The U.S. Army adopted it in 1873 and kept it as their official rifle until 1895. It continued in reserve and militia service until well into the 20th century.

The M1873 was sensitive to fouling and poor-quality ammunition; the extractor could slip off the expended cartridge and leave it stuck in the action. This was usually only a problem in rapid fire and with soft-cased cartridges. Unfortunately, the U.S. Army issued soft, copper-cased ammo until the late 1880s – it was cheaper, and Congress demanded economy. On a malfunction (p. B407), a stoppage indicates a stuck case that must be pried out using a knife or a screwdriver, taking *six* Ready maneuvers.

The M1873 took a 1-lb. socket bayonet (Reach 1, 2*).

The *M1873 Carbine* (1873-1878) had a shorter barrel and fired the weaker .45-55 cartridge: Dmg 4d-1 pi+, Range 400/2,600, Wt. 7.1/0.08, Bulk -5. This – rather than the Winchester (below) – was the U.S. Cavalry's weapon during the Indian Wars, as it had better range and power.

Winchester Model 1873, .44-40 Winchester (USA, 1873-1919)

The world's most famous lever-action rifle, the Winchester '73 was developed via the Volcanic Repeating Rifle (p. 109), Henry Rifle, and Winchester Model 1866.

The *Henry Rifle* (1862-1866) descended from the Volcanic but was chambered for the .44 Henry rimfire cartridge: Dmg 2d+1 pi+, Range 250/1,900, Wt. 10.1/0.6, Shots 15+1(4i), ST 6†, Cost $760. The Henry took a *long* time to reload. The underbarrel magazine had to be opened and the rounds loaded from the front. Only about 1,900 saw use during the American Civil War, in Union hands, but it was popular with civilians. Some 13,500 were made.

The *Winchester Model 1866* (1866-1898) – also in .44 Henry – introduced the side-loading gate of all later Winchester lever-actions, speeding up reloading considerably: Dmg 2d+1 pi+, Range 250/1,900, Wt. 10/0.7, Shots 17+1(3i), ST 8†. Nicknamed "Yellow Boy" due to its shining brass frame, the Winchester '66 was also available as a carbine (Dmg 2d pi+, Wt. 7.8/0.5, Shots 13+1) and as a long rifle with a bayonet mount (Dmg 2d+2 pi+, Wt. 9/0.7, Shots 17+1, Bulk -6). Many of the Sioux that defeated General Custer and the 7th Cavalry carried such rifles. Decades of Hollywood Westerns notwithstanding, the U.S. Army never adopted it – although some troopers purchased it with their own funds. About 170,000 were made.

The improved Winchester '73 chambered the more powerful .44-40 Winchester centerfire cartridge. It came in rifle, long rifle (Wt. 8.7/0.7, Shots 17+1, Bulk -6), and carbine (Wt. 7.8/0.5, Shots 12+1) versions. From 1879, it was also available in .38-40 Winchester (Dmg 3d-2 pi+) – and from 1882, in .32-20 Winchester (Dmg 2d+1 pi). Some 720,000 were made, the majority in rifle length and .44-40 caliber.

The *Model 1876* (1876-1897) was chambered for a more powerful cartridge, the .45-75 Winchester: Dmg 4d+1 pi+, Range 370/2,300, Wt. 10.1/1, Shots 12+1, ST 10†, Rcl 3, Cost $460. It was a favorite of Teddy Roosevelt. From 1879, it also came in .50-95 Express: Dmg 4d+2 pi+, Range 400/2,500, Wt. 10.2/1, Shots 10+1, ST 10†, Rcl 3, Cost $460. Some 64,000 were made.

The *Model 1892* (1892-1941) replaced the '73 as the standard Winchester lever-action. Available in the same calibers, most were made in .44-40 Winchester (use the same stats). With an extra-large loop for one-handed repeating (see *One-Armed Bandit,* p. 249), the Model 1892 features prominently in many Westerns, including *Stagecoach* and the TV series *The Rifleman*. The Model 1892 was also offered with a half-length magazine (Shots 6+1). With the barrel cut down to 12" and the shoulder stock sawn off, it serves as handgun for Josh Randall in *Wanted: Dead or Alive* (as the "Mare's Leg") and Zoë Warren in *Firefly:* Dmg 2d+2 pi+, Acc 2, Wt. 6.5/0.3, Shots 6+1, ST 11†, Bulk -3.

Sharps Model 1874, .50-90 Sharps (USA, 1875-1881)

The Sharps breechloading target rifle was a favorite of affluent American buffalo hunters. It had a heavy 30" barrel, double set triggers, and micrometer sights. Some 6,500 were made, in a variety of calibers. About a quarter of these were delivered from the factory with a telescopic sight – typically a long, 1.2-lb. 6× scope (+2 Acc).

The .50-90 cartridge first appeared in 1875. This was the "Big Fifty" of buffalo-hunting fame. Sharps rifles were also available in several other calibers, including .45-70 Springfield (Dmg 4d+1 pi+), and – by special order only – .45-110 Sharps (Dmg 5d pi+) or .50-140 Sharps (Dmg 5d+1 pi+).

Greener Elephant Rifle, 8-bore (U.K., 1881-1914)

A double-barreled rifle with exposed hammers and relatively short barrels, intended for hunting elephant and other massive game. Its huge, old-fashioned cartridge fired a short-ranged ball projectile. Such rifles were popular with white hunters in Africa and Asia until replaced by more modern Express rifles (which fire rounds like those described under *H&H Royal Double-Express,* pp. 111-112).

Lebel Mle 1886, 8×50mmR Lebel (France, 1886-1919)

The *Fusil d'Infanterie Lebel Modèle 1886* ("Lebel infantry rifle model 1886"), made by French arsenals to Nicolas Lebel's design, was the first smokeless-powder, medium-caliber military rifle. Some four million were produced. The Lebel was widely distributed – the French Foreign Legion and colonial army used it in their French conquests in Asia and Africa (as seen in Stephen Sommers' *The Mummy*), and it was exported to southern and eastern Europe during the 1920s. There were many variants, often used side-by-side. In 1936, the French military replaced the Lebel in front-line service.

The Mle 1886 was a bolt-action weapon with a tubular underbarrel magazine. It held a round in the chamber and another in the cartridge carrier between magazine and chamber, for a total of 10 when fully loaded. The great length of this design – even before attaching the 1.1-lb. socket bayonet (Reach 1, 2*) – is obvious in *All Quiet on the Western Front*. Fitted with a 1.2-lb. 3× scope (+1 Acc), the original Mle 1886 served as a sniper rifle from 1916 to WWII.

Redesigned by a commission headed by Adolph Berthier, the *Lebel-Berthier Modèle 1907/15* (1915-1918) used a three-round charger clip: Wt. 8.5/0.2, Shots 3(3). The improved *Lebel-Berthier Modèle 1916* (1916-1919) increased the clip capacity: Wt. 8.6/0.3, Shots 5(3).

Mosin-Nagant obr. 1891g, 7.62×54mmR Mosin-Nagant (Russia, 1891-1922)

The bolt-action *Pekhotniya Vintovka obrazets 1891g* ("infantry rifle model 1891") was the standard Russian rifle until the 1930s. It was still fielded in large numbers during WWII. Some 10 million were made. The PV-1891 used five-round charger clips. It took a 1.1-lb. socket bayonet (Reach 1, 2*), which was nearly always mounted in Russian service.

The shortened *Vintovka obrazets 1891/30g* (1931-1958) replaced the PV-1891: Dmg 7d pi, Range 1,000/4,200, Wt. 9/0.3, Bulk -5. More than 18 million were made and widely exported after WWII. Fitted with a 1.3-lb. 4× scope (+2 Acc), the V-1891/30 was the standard Soviet sniper rifle, as seen in *Enemy at the Gates*. From late 1941, a 1.1-lb. wiper suppressor was available (-2 to Hearing, -1 Bulk, lasts 85 shots). This required the use of subsonic ammunition (p. 165): Dmg 4d pi, Range 380/1,600, and a total of -4 to Hearing (*including* bolt-action modifier).

Winchester Model 1894, .30-30 Winchester (USA, 1895-2006)

The Browning-designed Model 1894 was Winchester's first smokeless-powder rifle, and the earliest such weapon commonly available in America. It was operationally identical to the long line of lever-action, tube-magazine rifles going back to the Winchester '66 (no unfamiliarity penalty). More than six million were made.

No major power adopted the Model 1894 as a standard military rifle, but it saw wide use in such conflicts as the Mexican Revolution of 1910. The Royal Navy used some for boarding parties in WWI. Many police departments acquired it, especially in the U.S. South and Southwest. It was the standard rifle of most American prison systems, and the gun most likely to be found in closets or pickups across North (and South) America. After its introduction, any small-town grocery or hardware store in the U.S. was liable to have a few boxes of .30-30 ammo.

Mauser Gew98, 7.92×57mm Mauser (Germany, 1900-1918)

The *Gewehr 98* ("rifle model 1898") was the standard rifle of the German military during WWI. Many consider it to be the finest bolt-action design ever. Mauser rifles were made in many calibers; the '98 action was so successful that it was used throughout the entire 20th century for everything from infantry carbines through sniper rifles to hunting shotguns. It was also widely licensed and copied. In many conflicts up to the 1950s, *both* sides were armed with Mausers.

The Gew98 accepted a 1-lb. knife bayonet (Reach 1, 2*) and used five-round charger clips. During WWI, a few received extended, clip-charged "trench" magazines taking 25 rounds: Wt. 11.3/1.5, Shots 25(15). From 1915, a 1.1-lb. 4× scope (+2 Acc) was issued to snipers.

The Gew98 was widely exported in many calibers, including 7×57mm Mauser (Dmg 6d+2 pi) to the Boers, Brazil, and Mexico, and 7.65×53mm Mauser (Dmg 6d+2 pi) to Argentina, Bolivia, and Turkey. In the 1920s, many old '98 actions were mated with new stocks and barrels and converted to 12G 2.75" shotguns for export to Africa and the Americas: Dmg 1d+1 pi, Acc 3, Range 40/800, Wt. 6.2/0.2, RoF 1×9, Shots 2+1(3i), ST 10†, Rcl 1/6.

The *Pirschbüchse C98/07* (1907-1938) was a hunting rifle in 8×60mm Mauser: Dmg 7d pi, Wt. 7.5/0.3, Shots 5(3i). Alternative calibers included 7×57mm Mauser (Dmg 6d+2 pi) and 10.75×68mm Mauser (Dmg 7d+1 pi+). Many were decorated; see *Styling* (p. 10).

The *Karabiner 98 Kurz* (1935-1946) short rifle was the German infantry rifle of WWII: Dmg 7d pi, Range 1,000/4,300, Wt. 8.9/0.3, Shots 5+1(3), ST 10†, Cost $400. The Kar98k was widely exported, licensed, and copied; it was easily the most common military rifle worldwide from the 1930s to the 1950s. The German military alone acquired over 10 million. Other users included China, Czechoslovakia, Israel, Persia, Poland, Romania, Spain, Turkey, and Yugoslavia.

H&H Royal Double-Express, .600 Nitro Express (U.K., 1903-1974)

This Holland & Holland piece was the world's most powerful hunting rifle from its introduction until the late 1950s. The only weapons chambered for the .600 Nitro Express were pricy, break-open, double-barreled rifles in the English style . . . and the Royal Double-Express was normally only sold at the gun makers in London and in the most exclusive sporting-goods stores of the world's major cities. Custom-made on demand, with the usual wait for delivery being a year or more, it was *very* expensive. In Africa, used guns were sometimes available at a bargain – frequently because the last owner had made one mistake too many with elephant or rhino.

Holland & Holland ceased making rifles in this caliber in 1974. Occasionally, other manufacturers still produce similar specimens to order. *Used* guns in good condition easily fetch up to $60,000 today.

From 1907, another popular caliber was .470 Nitro Express: Dmg 8d+2 pi+, Range 640/4,000, Wt. 14.2/0.24, ST 12†, Rcl 5. In 1989, H&H introduced the .700 Nitro Express: Dmg 5d×2 pi++, Range 600/3,800, Wt. 19.3/0.5, ST 15†, Rcl 9, Cost $116,000.

The (original!) owner of a custom-made H&H rifle should consider buying a Weapon Bond (p. 250).

Remington Model 8, .35 Remington (USA, 1906-1936)

This Browning invention was the earliest successful self-loading rifle. Used mainly as a hunting weapon, the Model 8 – and the virtually identical *Model 81 Woodsmaster* (1936-1950) – was a popular choice with American law enforcers (notably the FBI and Texas Rangers) during the 1930s and 1940s. Counting both models, some 136,000 were made. It can be seen in the Western *Ride the High Country.*

The Model 8 breaks down into two parts for easy stowage (Holdout -3). Assembly requires 20 seconds and an IQ-based Guns (Rifle) or Armoury (Small Arms) roll. An alternative chambering is .30 Remington (Dmg 5d pi). One can load the rifle using five-round charger clips (takes nine seconds) or with individual cartridges (three Ready maneuvers per round). "Police only" magazine extensions for 10, 15, or 20 rounds became available in the 1930s.

Springfield M1903, .30-06 Springfield (USA, 1906-1943)

In 1906, the U.S. Army started issuing the M1903 – essentially a copy of the Mauser '98 (p. 111), but exceptional for its well-fitted action, excellent sights, and highly developed cartridge. This rifle spread worldwide as both a military weapon (the U.S. handed them out as military assistance during and after WWII) and a sporting gun. Two million were made.

The M1903 took a 1.1-lb. sword bayonet (Reach 1, 2*) and used five-round charger clips. During WWI, a few rifles received extended, clip-charged magazines: Wt. 10/1.2, Shots 20(12).

The *M1903A4* (1943-1944) was a sniper variant with 2.5× scope: Acc 5+1, Wt. 9.7.

Arisaka Meiji 38 Shiki Shoujuu, 6.5×50mmSR Arisaka (Japan, 1907-1941)

The *Arisaka Meiji 38 Shiki Shoujuu* ("Arisaka infantry rifle type of the 38th year of the Meiji reign") was loosely based on the Mauser '98 bolt-action (p. 111). It was the standard Japanese rifle until 1939 and still in widespread use during WWII. More than three million were made. It was widely exported in the 1910s and 1920s; during WWI, the United Kingdom bought 150,000 as the *Pattern 07* (used by T. E. Lawrence's troops during the Arab Revolt), and Russia acquired over half a million. Mexico adopted an export variant in 7×57mm Mauser (Dmg 6d+2 pi).

The Arisaka 38 Shiki used five-round charger clips and took a 0.9-lb. sword bayonet (Reach 1, 2*). A 1.1-lb. 2.5× scope (+1 Acc) transformed it into a sniper rifle.

The weapon's replacement, the Arisaka *99 Shiki Tanshoujuu* (1939-1945), was in 7.7×58mm Arisaka: Dmg 6d+2 pi, Range 900/3,900, Wt. 8.6/0.3.

Enfield SMLE Mk III, .303 British (U.K., 1907-1943)

The Short Magazine, Lee-Enfield Mark III served the British Army during both World Wars. It was widely distributed to Commonwealth nations, and also produced in Australia and in India (where reserve units still use it). Seven million were made.

The SMLE Mk III was one of the fastest bolt-action rifles to operate. "Old Smelly" had a magazine topped up with single cartridges or five-round charger clips (0.3 lb.). The magazine was detachable (1 lb.) but normally not used as such – each rifle came with only one. (If a spare magazine is available, reloading takes only three Ready maneuvers.) The gun took a 1.3-lb. sword bayonet (Reach 1, 2*).

This design saw numerous variations during its century of service. The earliest was the *Lee-Metford Mk I* (1889-1892), which still fired black-powder ammo. It had an eight-round magazine and *couldn't* use charger clips: Dmg 5d+2 pi, Range 700/3,000, Wt. 10/0.5, Shots 8+1(3i), Bulk -6. Some 360,000 were made. The *Lee-Metford Mk II* (1892-1895) introduced the 10-round magazine: Dmg 5d+2 pi, Range 700/3,000, Wt. 9.9/0.6, Shots 10+1(3i), Bulk -6.

The *SMLE Mk I* (1903-1907) – which fired the improved smokeless cartridge and introduced clip-loading – was the first of the short rifles to unify infantry rifles with carbines: Wt. 8.7/0.6, Shots 10+1(5).

The *Number 4 Mk I* (1941-1945) was a cheaper wartime derivative: Wt. 9.6/0.6, Shots 10+1(5). More than four million were made in Australia, Canada, India, the U.K., and the U.S.

The Sterling *De Lisle Mk I* (1944-1945) was a suppressed commando weapon built on the SMLE Mk III. It was chambered for .45 ACP, had an integral baffle suppressor (-3 to Hearing, *including* bolt-action modifier), and used the magazine of the Colt Government (pp. 98-99): Dmg 3d-1 pi+, Acc 3, Range 150/1,600, Wt. 8.7/0.5, Shots 7+1(3), ST 9†, Bulk -4, Rcl 2. Some 200 were made. It saw action as late as the 1950s, in Korea and Malaysia.

The last British service version of the Enfield was the *L42A1* (1965-1970), a sniper rifle in 7.62×51mm NATO, with a 3× scope: Dmg 7d pi, Acc 6+1, Range 1,000/4,200, Wt. 10.8/1, Shots 10+1(3). It was used until the late 1980s.

Mauser Tank-Gewehr 18, 13×92mmSR Mauser (Germany, 1918)

Caught unprepared by the British invention of the tank in WWI, the Germans introduced a huge, single-shot bolt-action rifle to combat armored vehicles. (It would also give good service against *Lost World* creatures!) Some 15,800 were made. Most were destroyed after the war.

The 5.5'-long weapon fired an APHC bullet capable of penetrating all tanks of its time. The T-Gew18 was fired prone from its integral bipod. Its fearsome recoil broke the collarbone of many a German soldier (an 18 on the attack roll for a firer with less than minimum ST does 1d-4 cr damage).

Browning M1918 BAR, .30-06 Springfield (USA, 1918-1924)

The Browning Automatic Rifle (BAR) – which entered U.S. service in 1918 – was a heavy, full-automatic rifle designed to be fired from the hip or shoulder on the assault. Some 100,000 were made, but came too late for major service during WWI. Between the wars, American police and prison security forces adopted the BAR, and it saw use with gangsters such as Bonnie and Clyde, who stole the guns from police stations and National Guard armories. (Clyde liked to cut off barrel, sights, and butt: Dmg 6d+2 pi, Acc 3, Wt. 15.2,

ST 12†, Rcl 3.) A burst from it was a lot more likely to disable a car than a burst from a Tommy gun (p. 122). The M1918 was still the standard squad automatic weapon of U.S. forces in early WWII. It used detachable 20-round magazines, and AP ammo (Dmg 5d(2) pi-) was available.

The Colt *R75* (1925-1942) was a commercial variant with pistol grip, heavier barrel, and bipod: Wt. 21.4, ST 11B†. Some 5,000 were made for police departments, civilian sale, and export.

The Colt *R80 Monitor* (1931-1942) was another commercial variant, with pistol grip, short barrel, and compensator: Dmg 6d+2 pi, Acc 4, Wt. 17.3, ST 11†, Bulk -5, Cost $3,600. Only 125 were made, most going to the FBI.

The *M1918A2* (1943-1953) had a heavier barrel and a bipod to improve its performance as a squad automatic weapon: Wt. 22.5, RoF 6/9!, ST 11B†. It couldn't fire single shots, but had two selectable rates of fire (low at RoF 6!, high at RoF 9!). During late WWII and the Korean War, it often doubled as a LMG, and was supplied in large numbers to many U.S. allies. Some 250,000 were made. The U.S. Army used it with satisfaction until 1959; National Guard units still had it in the 1970s.

During the 1920s and 1930s, licensed variants comparable to the M1918A2 were made by Sweden in 6.5×55mm Mauser (Dmg 6d pi), by Belgium in 7.65×53mm Mauser (Dmg 6d+2 pi), and by Poland in 7.92×57mm Mauser (Dmg 7d pi).

Springfield M1 Garand, .30-06 Springfield (USA, 1937-1957)

The M1, designed by John Garand, was the first successful semiautomatic rifle to see widespread use. It gave the U.S. a distinct advantage in WWII, when its adversaries were armed mainly with bolt-action rifles. Adopted by the U.S. Army in 1936 and standard during WWII, it was distributed around the world after 1945. Six million were made. Japan tried to copy it in 1945 in 7.7×58mm Arisaka (Dmg 7d pi), while Italy was licensed to manufacture it in the 1950s. The Garand wasn't normally available to civilians until 1959.

The Garand fired a powerful and accurate cartridge, and its gas-operated action made control in rapid fire much easier than with manual actions. It used an eight-round en bloc clip, which was ejected when empty with an embarrassing "ping." It took a 1.1-lb. sword bayonet (Reach 1, 2*) or, from 1943, a 0.8-lb. knife bayonet (Reach 1).

The *M1C* (1944-1945) was a sniper version mounting a 2.5× scope: Acc 5+1, Wt. 11.7.

Winchester Model 70, .30-06 Springfield (USA, 1937-2006)

This successful hunting rifle was based on the Mauser '98 bolt-action (p. 97). The two-dozen standard calibers available at different times have included the .220 Swift (Dmg 6d+2 pi), 7.62×51mm NATO (Dmg 7d pi), and .375 H&H Magnum (Dmg 8d+2 pi, Shots 4+1) – but four in five were in .30-06. Some 1.5 million were produced. Most owners added a telescopic sight.

The famous *Model 70 African* (1956-2006) was chambered for the .458 Winchester Magnum: Dmg 8d pi+, Range 1,100/6,700, Wt. 9.6/0.3, Shots 3+1(3i), ST 12†, Rcl 7, Cost $4,700.

Steyr-Solothurn S18-1000, 20×138mmB Solothurn (Austria/Switzerland, 1938-1940)

The S18-1000 was a bipod-mounted, 7.1'-long semiautomatic rifle designed for use against tanks. It verged on being a small cannon, and was too massive to fire from the hip or shoulder (except by a giant or a mecha, which would require a larger trigger!). When introduced, it was the world's most powerful man-portable antitank weapon. It was acquired by the Dutch East Indies, Italy, the Netherlands, Sweden, and Switzerland, and saw heavy use in the North African campaign of WWII.

The S18-1000 fed from a 10-round magazine inserted from the left-hand side. It fired AP (in the table) and SAPHE (Dmg 6d×3 pi++ with a 2d [1d] cr ex follow-up). A 2.75× scope was standard. It could be disassembled into 44-lb. and 73-lb. loads for backpack transport. An alternative was a manually pulled two-wheeled carriage (see *Pulling and Dragging,* p. B353), which weighed 306 lbs. with gun and a case holding three magazines.

The very scarce *S18-1100* (1938-1940) was identical, but capable of full-automatic fire: RoF 14.

Winchester M1, .30 M1 Carbine (USA, 1942-1945)

The U.S. Army adopted the M1 carbine to replace sidearms, giving vehicle and heavy-weapon crews a firearm longer-ranged than a pistol but less cumbersome than a rifle. Over 5.5 million were made; the M1 proved popular despite the .30-caliber round's mediocre stopping power. It continued to see service in Korea and in Vietnam, mainly with Asian troops. Surplus weapons were common with police forces and prison guards – especially in the Americas and Southeast Asia – and were used in many high-profile shootings in the U.S. in the 1960s and 1970s. The M1 was license-made in Japan after WWII, and commercial production by other manufacturers resumed in 1960.

The M1 used a detachable box magazine. Late-production carbines took a 1-lb. knife bayonet (Reach 1).

The *M1A1* (1942-1945), with a folding stock, was intended for parachutists: Wt. 6.2/0.6, Bulk -4*. Some 150,000 were made.

The *M2* (1944-1945), a selective-fire variant of the M1, became the more common version in military service after WWII. About 570,000 were made. From April 1945, it came with a curved 30-round magazine: Wt. 6.3/1.1, RoF 12, Shots 30+1(3), Cost $450/$29. Illegally filing the sear on a standard M1 also allowed full-auto fire but made the weapon unreliable: Malf. 14, RoF 12!. A well-used M1 with a worn sear would sometimes burst-fire unexpectedly – which could be quite disconcerting to the firer!

The *M3* (1944) was an M2 fitted with a "Sniperscope" consisting of a 70-yard IR illuminator (p. 47) and a 4× early night sight (p. 156), adding 5 lbs. to weight and giving +2 Acc and Night Vision 2. A heavy battery assembly carried in a rucksack (6 lbs., 2×M/2 hrs.) provided power. Only 2,100 were made, but they were used effectively against the Japanese in WWII. An improved version with a 125-yard illuminator was fielded during the Korean War.

The Universal *Model 3000 Enforcer* (1964-1983) was a cut-down "pistol" with 10.3" barrel and no stock: Dmg 4d-1 pi, Acc 3, Range 280/1,800, Wt. 5.3/1.1, Shots 30+1(3), ST 8†, Bulk -3, Rcl 3, Cost $600/$29, LC2.

The Kalashnikov

Taking into account all of its many models, the Kalashnikov rifle has probably been made in greater numbers than any other gun. Estimates of worldwide production exceed 90 million weapons. It was principally responsible for the elimination of the African elephant herds; it appears on the national flag of at least one country (Mozambique) and in the insignia of numerous political factions and terrorist groups; and even people with only minimal familiarity with firearms can usually recognize its silhouette at a glance. In modern African trouble spots, a loaded, second-source, fourth-hand AK can be had for as little as $5. A brand-new gun costs $90 from the factory . . . if you take a few thousand. In the U.S., semiautomatic versions sell for around $300.

All of the variants below are similar in operation; there's no familiarity penalty to go from one to another.

Izhmash AK-47, 7.62×39mm (Russia, 1951-1960)

The *Avtomat Kalashnikova obrazets 1947g* ("Kalashnikov's automatic rifle model 1947") was the original rifle version, with a heavy, milled receiver and the distinctive curved magazine. By the mid-1950s, it had been exported in large numbers to Communist forces everywhere, and licensed to numerous states, including Bulgaria, China, East Germany, Finland, Hungary, Poland, and Romania. Nine million were made in Russia alone. Pakistani gunsmiths still sell hand-made copies today.

The AK-47 takes a 0.6-lb. multi-purpose bayonet (Reach 1). It's often loaded with API ammo (Dmg 4d-1(2) pi- inc).

The *AKS-47* (1951-1960) had a folding stock: Wt. 10.6, Bulk -5*.

The *RPK* (1955-1988) had a longer barrel and a bipod: Dmg 6d pi, Acc 5, Range 600/3,900, Wt. 13/2.5, Shots 40+1(3), ST 9B†, Cost $900/$32. There was also a 75-round drum (-1 Bulk, $264, 4.6 lbs.). Both magazines work in the AK-47.

The modernized *AKM* (1960-1985) had a cheaper and lighter stamped receiver: Wt. 8.7. The AKM became even more widespread than the AK-47, and is the variant most often encountered. Many continue to call it the "AK-47." It has been made in Bulgaria, East Germany, Egypt, India, Iraq, North Korea, Poland, Romania, and Yugoslavia.

The *AKMS* (1960-1985) had a folding stock: Wt. 9.4, Bulk -5*.

The *AK-103* (1993-) is the latest model, with a plastic folding stock and plastic magazine: Wt. 9.1/1.6, Bulk -5*.

Izhmash AK-74, 5.45×39mm (Russia, 1974-1990)

This was basically an improved AKM chambered for a smaller-caliber cartridge. The most readily apparent differences were a prominent muzzle brake and a new synthetic-covered magazine (originally orange, later brown or black). The muzzle brake was effective but increased muzzle blast (+2 to any Hearing or Vision roll to locate an AK-74 firing in the dark). Some 6.5 million were made, and it was licensed to Bulgaria, East Germany, North Korea, Poland, and Romania.

The AK-74 takes a 0.6-lb. multi-purpose bayonet (Reach 1). A 60-round high-density magazine ($40, 2.7 lbs.) became available in the 1990s.

The *AKS-74* (1975-1990) had a folding stock: Wt. 8.8, Bulk -5*.

The *AKS-74U* (1979-1992) was a carbine for service with vehicle crews and special-ops forces (terrorist Osama bin Laden seems to favor it, too). It had a folding stock and a much shorter barrel: Dmg 4d-1 pi, Acc 3, Range 360/2,500, Wt. 6.7, RoF 13, ST 8†, Bulk -4*. It could be fitted with a 1.4-lb. wiper suppressor (-1 to Hearing, -1 Bulk, lasts 90 shots), which required the use of subsonic ammunition (p. 165): Dmg 2d-1 pi, Range 250/1,600, and the total Hearing penalty is -2.

The modernized *AK-74M* (1989-) is currently in service with Russian front-line units. It has a plastic folding stock: Wt. 8.3, Bulk -5*. It can mount a 2-lb. 4× night sight (+2 Acc and Night Vision 5, XS/10 hrs).

The *RPK-74* (1976-1990) was a squad automatic version with a longer barrel and a bipod: Dmg 5d+1 pi, Acc 5, Range 650/4,200, Wt. 12.2/1.8, Shots 45+1(3), ST 9B†, Cost $900/$36. There was also a 90-round drum (-1 Bulk, $262, 4.6 lbs.). Both magazines work in the AK-74.

The *AK-101* (1993-) is chambered for the 5.56×45mm NATO round: Dmg 4d+2 pi, Wt. 8.3/1.3, Bulk -5*.

Rheinmetall FG42, 7.92×57mm Mauser (Germany, 1943)

The *Fallschirmjägergewehr 42* ("parachutist's rifle model 1942") was a unique automatic rifle intended to arm the *Luftwaffe*'s airborne troops. Using a bullpup arrangement with the magazine inserted horizontally on the left-hand side, it had a relatively short overall length and a bipod for prone firing. Only a few hundred were made for trials – but it was used in the daring raid to free Mussolini in 1943.

Late-production guns further developed by Krieghoff appeared in 1944-1945, with various detail changes. The final version had Wt. 12.9/2, RoF 12. Perhaps 5,000 were made. Some were fitted with a 1.3-lb. 4× scope (+2 Acc). A 10-round magazine was available ($28, 1.1 lbs.).

Haenel StG44, 7.92×33mm Kurz (Germany, 1944-1945)

The Schmeisser-designed *Sturmgewehr 44* ("assault rifle model 1944") was the first assault rifle in name, shape, and function. Firing an intermediate-power round, it evolved via the MKb42, MP43, and MP44 – all of which were basically the same gun (use the same stats). A few thousand MKb42s were successfully tested at the front in 1942, whereupon the MP43 went into full production. Production changes led to the MP44, which was renamed the StG44 in late 1944. Some 426,000 were made. It continues to surface in conflicts in Africa, the Middle East, and Southeast Asia.

In late 1944, about 300 weapons were fitted with the secret ZG1223 *Vampir* active-IR sighting system. This consisted of a 75-yard IR illuminator (p. 47) and a 4× early night sight (p. 156), adding 5.1 lbs. to weight and giving +2 Acc and Night Vision 2. A battery assembly carried in a rucksack (30 lbs., 2×L/4 hrs.) provided power.

Also in 1944, some 1,500 guns received detachable *Krummlauf* ("curved barrel") extensions. The *SGV J* had a 30° curvature and a prism sight, for use by infantry to shoot around corners: Acc 3, Wt. 16, Bulk -6, and attack rolls are at -2. The *SGV P,* with a 90° curvature and a 1.25× prism scope, was intended for tank crews to shoot through a roof firing port (p. 228) at infantry attacking from within the dead angles of the tank's guns: Acc 2, Wt. 17.7, Bulk -6, and attack rolls are -4.

TOZ SKS-45, 7.62×39mm (Russia, 1949-1955)

The *Samozaryadinyi Karabina Simonova obrazets 1945g* ("Simonov's self-loading carbine model 1945") was a semiautomatic rifle chambering the 7.62×39mm intermediate cartridge. A pre-production lot was used in combat in early 1944, and some were employed in the Battle of Berlin in 1945, but full-scale production didn't start until 1949. The SKS served in the Soviet army until the widespread issue of the AK-47 (p. 114). It was manufactured in Albania, China, East Germany, North Korea, Romania, and Yugoslavia; Chinese-made versions were widely used by the Viet Cong during the Vietnam War. During the 1980s, surplus weapons and commercial variants were exported in large numbers. In the early 1990s, it was the best-selling rifle in the U.S., where hunters and "survivalists" bought an estimated two million guns.

The SKS uses 10-round charger clips. Many rifles sold as surplus have been modified to use detachable AK-47 magazines instead. The permanently attached bayonet (Reach 1) swivels under the muzzle when not in use.

FN FAL, 7.62×51mm NATO (Belgium, 1953-1987)

The Belgian *Fusil Automatique Légère* ("light automatic rifle") was a huge success; over 90 nations ultimately adopted it. It was made under license in Argentina, Australia, Austria, Brazil, Canada, India, Israel, Mexico, South Africa, the U.K., and Venezuela. Some countries – including Australia, Canada, India, the Netherlands, and the U.K. (there called the L1A1) – acquired semiautomatic versions (RoF 3). The FAL armed the British in Malaya, the Australians and New Zealanders in Vietnam, and *both* sides in many African conflicts of the 1960s and 1970s, as well as in the 1982 Falklands War.

The FAL used a detachable magazine and took a 0.5-lb. socket bayonet (Reach 1, 2*). Commonwealth rifles could accept the 30-round magazine ($33, 2.6 lbs.) of the L4A4 variant of the Bren (p. 133). British rifles were often fitted with a 1-lb. tritium-illuminated 4× scope (+2 Acc and removes -2 from darkness penalties).

The *FAL-Para* (1955-1987) had a shorter barrel and a folding stock: Dmg 7d-1 pi, Range 900/3,900, Wt. 9.9/1.6, Bulk -5*.

Springfield M14, 7.62×51mm NATO (USA, 1957-1964)

The M14 was based on the M1 Garand (p. 113) but chambered in 7.62×51mm NATO, equipped with a detachable 20-round magazine, and capable of selective fire. Some 1.4 million were made; it was also licensed to Taiwan. A 5.9-lb. 4× night sight (+2 Acc and Night Vision 4, 2×S/72 hrs.) became available in 1965. Duplex ammo was sometimes issued in Vietnam: Dmg 6d pi, Range 500/2,100, RoF 12×2, Rcl 2.

Based on the M14, the RIA *M21* (1969-1970) was the U.S. Army's standard sniper rifle until 1988. This fine (accurate) weapon had a match-grade barrel and a 1.4-lb. 3-9× variable scope: Acc 6+3, Wt. 12.7, RoF 3, Cost $4,500, LC3. It accepted a 3.6-lb. baffle suppressor (-3 to Hearing, -1 Bulk). A 3.3-lb. 4× night sight (+2 Acc and Night Vision 5, 2×S/30 hrs.) was introduced in 1978. Commercial copies went on sale in the 1990s.

The Springfield *M1A* (1971-) is a semiautomatic M14 produced for civilian sale as a hunting and target rifle: Wt. 10.6/1.6, RoF 3, Cost $1,500, LC3. More than 230,000 have been made.

The RTE *M14 Designated Marksman Rifle* (2002-) is a refurbished M14 fitted with a synthetic stock, a bipod, and a 1.4-lb. 3.5-10× variable scope: Acc 5+3, Wt. 11/1.6, RoF 3, Cost $2,500, LC3. The U.S. Marine Corps issues it at squad level.

The NSWC Crane *MK 14 MOD 0 Enhanced Battle Rifle* (2005-), adopted by U.S. special-ops forces, is a refurbished M14 with a shortened barrel, accessory rails, and a retractable stock: Dmg 6d+2 pi, Range 850/3,750, Wt. 14.6/1.6, Bulk -4*, Cost $2,900.

ArmaLite AR-7 Explorer, .22 LR (USA, 1959-1973)

The AR-7 was a light, cheap, but unreliable semiautomatic survival carbine. ArmaLite stopped making it in 1973, but it has been continuously available as other producers acquire the rights to the design. It sells well among recreational "plinking" shooters and people who want to have a handy rifle in their camper or yacht.

The AR-7's barrel, receiver, and magazine stow inside the hollow plastic stock when disassembled (Holdout -3). Assembly requires 20 seconds and an IQ-based Guns (Rifle) or Armoury (Small Arms) roll. The gun floats in either configuration.

Remington Model 700, 7.62×51mm NATO (USA, 1962-)

This is probably the most popular modern American bolt-action rifle, used in large numbers by hunters and by military and police marksmen. The standard version comes with a wooden or synthetic stock and open sights. Most people fit a scope (pp. 155-156, p. B412). It's available in three-dozen different calibers, including .30-06 (Dmg 7d+1 pi) and .300 Remington Ultra Magnum (Dmg 9d+1 pi). The U.S. Secret Service uses it in 7mm Remington Magnum (Dmg 7d+2 pi).

Flechette Rifle

Weapons firing flechette ammunition (SAPFSDS, p. 168) appear at TL7-8.

AAI XM19 SFR, 5.6×57mm (USA, 1968-1970)

The XM19 Serial Flechette Rifle (SFR) was a conventionally styled assault rifle that fired saboted flechettes from a smoothbore barrel. Early prototypes used a 60-round drum magazine; later versions, a conventional curved 50-round magazine. It offered single shots, three-round high-cyclic controlled bursts (p. 83), and full-automatic fire. Intended to replace the M14 (p. 115) and M16A1 (p. 117), the XM19 program was terminated in 1972 due to unreliability and excessive muzzle blast (+2 to Hearing and Vision rolls to locate it firing in the dark). Only 30 weapons were made.

The Model 700-based *M40* (1962-1966) – a fine (accurate) weapon fitted with a 10× scope – was a standard USMC sniper rifle: Acc 6+3, Wt. 14.7/0.3, Shots 5+1, Cost $2,100.

The *M24* (1988-) is the standard U.S. Army sniper rifle, replacing the M21 (see *Springfield M14,* p. 115): Acc 6+3, Wt. 13.4/0.3, Shots 6+1, ST 11B†, Cost $5,000. It's fine (accurate), and features a bipod and a 1.3-lb. 10× scope. Since 1996, it can mount a 4.9-lb. 8.5× night sight (+3 Acc and Night Vision 7, 2×XS/10 hrs.) instead – or since 1997, a 5.5-lb. 10× thermal sight (+3 Acc and Infravision, M/12 hrs.).

All sniper versions are normally issued with match-grade ammo (+1 Acc).

Izhmash SVD, 7.62×54mmR Mosin-Nagant (Russia, 1963-)

The *Snayperskaya Vintovka Dragunova* ("Dragunov's sniper rifle") is a scoped, semiautomatic weapon fed by a detachable magazine. It's intended to provide a squad with more accurate fire than a Kalashnikov assault rifle (p. 114) can deliver, but it isn't a true sharpshooter's rifle. The SVD has been made in China and Iraq, and was widely used in Afghanistan, Chechnya, and Nicaragua.

The SVD takes the AK-47's 0.6-lb. multi-purpose bayonet (Reach 1, 2*). It normally mounts a 1.3-lb. 4× scope with a battery-illuminated reticle (+2 Acc and removes -2 from darkness penalties, XS/100 hrs.). From the 1980s, a 2.9-lb. 5× night sight (+2 Acc and Night Vision 6, 2×XS/10 hrs.) is available to replace this.

The *SVDS* (1994-) is similar but has a shorter barrel and folding stock for use by paratroops: Dmg 6d+2 pi, Acc 5+2, Range 900/4,000, Wt. 11.4/0.7, Bulk -6*.

H&K G3A3, 7.62×51mm NATO (Germany, 1964-2004)

In 1959, the West German army adopted the *Gewehr 3,* a sturdy, recoil-operated automatic rifle. The main production version was the improved G3A3. Most non-Communist countries that didn't select the FN FAL (p. 115) opted for the G3; many chose it to *replace* the FAL. It has been made in Burma, Greece, Iran, Mexico, Norway, Pakistan, Portugal, Saudi Arabia, Sweden, and Turkey – and, for export, in England and France.

The G3 takes a 0.5-lb. knife bayonet (Reach 1). Lighter but flimsier aluminum magazines are available ($36, 1.4 lbs.), as is a 50-round drum (-1 Bulk, $264, 4.3 lbs.). Both a 1.4-lb. 4× scope (+2 Acc) and a 1.3-lb. bipod can be simply clipped on.

A semiautomatic civilian version was sold as the *HK91A2 (*1976-1989): RoF 3, LC3.

The *G3A4* (1964-2004) was a G3 fitted with a retractable stock, for paratroops and mechanized infantry: Wt. 12.1, Bulk -5*, Cost $1,650. The *G3KA4* (1983-2004) had a shortened barrel: Dmg 6d pi, Acc 4, Range 800/3,500, Wt. 11.4, Bulk -5*, Cost $1,650.

The *PSG1* (1982-) is a purpose-built sniper version, featuring a match-grade barrel, an adjustable shoulder stock, a pistol grip with palm rest, an adjustable trigger, and a 1.3-lb. 6× scope with a battery-illuminated reticle (+2 Acc and removes -1 from darkness penalties, 3×T/100 hrs.): Dmg 7d pi, Acc 6+2, Range 1,100/4,400, Wt. 18.5/0.7, Shots 5+1(3), Bulk -6, Cost $9,100/$26. It's a fine (accurate) weapon. It lacks iron sights, flash hider, and bipod; it's intended to be propped on a sandbag or a small, 2.25-lb. tripod (+1 Acc for bracing). It comes with a five-round magazine but can use G3 magazines. Numerous antiterrorist and hostage-rescue units adopted the PSG1.

The *HK33* (1965-1972) was the G3A3 scaled for the .223 Remington round: Dmg 4d+2 pi, Range 460/2,900, Wt. 9.5/1.2, RoF 12, Shots 25+1, ST 9†, Rcl 2, Cost $1,200/$28. The *HK33A2* (1972-2004), identical in game terms, replaced it. The HK33A2 has been license-made in England, Malaysia, Thailand, and Turkey. A 40-round magazine ($30, 1.4 lbs.) is available for HK33-series rifles.

The *HK53A3* (1975-2004) was a carbine variant of the HK33A2, and as compact as the MP5A3 submachine gun: Dmg 3d+2 pi, Acc 4, Range 320/2,000, Wt. 7.9/1.2, RoF 12, Shots 25+1, ST 9†, Bulk -4*, Rcl 2, Cost $1,450/$28. Its muzzle flash gives +2 to any Hearing or Vision roll to locate it firing in the dark.

Marlin Model 444, .444 Marlin (USA, 1965-)

This lever-action rifle is chambered for a unique cartridge similar to the .44 Magnum, but more powerful and better-suited to a hunting rifle. At short range, it has more knockdown power than typical lever-action rounds.

Colt M16A1, .223 Remington (USA, 1967-1984)

In 1958, ArmaLite submitted the AR-15 assault rifle for U.S. military trials. Developed by Eugene Stoner, it was the first assault rifle chambered for a small-caliber round. It set new standards for the use of such lightweight materials as aluminum and plastics. Colt licensed production in 1959. In 1962, the USAF became the first service to adopt it, issuing it to ground-security forces.

From 1964, the U.S. Army and Marine Corps acquired large numbers of the AR-15 as the *M16* (1964-1967), for forces in Vietnam. It was initially welcomed for its light weight. Unfortunately, the combination of nonstandard propellant with the erroneous belief that the rifle didn't need cleaning – when its direct gas-action actually required *extra* care – led to serious stoppages (Malf. 16) that couldn't be cleared by anything less than full disassembly (requires Armoury (Small Arms); see p. B407). The result was a loss of faith in the "Mattel rifle" – so called because of its cheap, toy-like appearance.

The improved M16A1 addressed these problems – notably, it allowed easier clearing of jams – and quickly became the standard U.S. military rifle. Export customers and police agencies soon adopted it as well. Many millions were made. Licensed production took place in the Philippines, Singapore, and South Korea, and it was copied in China and Iran.

The original rifle used a detachable 20-round magazine. From 1967, special-ops units had access to 30-round magazines ($34, 1 lb.), which became standard issue in 1975. Aftermarket accessories include everything from five-round magazines ($31, 0.35 lb.) to 100-round twin drums ($313, 5 lbs.). A quick-detachable 0.5-lb. bipod is available. The M16A1 takes a 0.6-lb. knife bayonet (Reach 1).

The *AR-15 R6000 Sporter* (1963-1984) was a semiautomatic version popular with U.S. civilians and police: RoF 3, LC3.

The *M16A2* (1984-), the M16A1's improved successor, entered U.S. military service in the mid-1980s. Changes included a three-round burst-limiter, modified 5.56×45mm NATO ammunition, a new barrel, and new sights: Range 800/3,500, Wt. 8.9/1, RoF 9, Cost $850. It was widely adopted by such federal agencies as the FBI. Many U.S. police departments and export customers also use it. The M16A2 takes a 1-lb. multi-purpose bayonet (Reach 1).

The *M16A3* (1992-), adopted by the U.S. Navy, allows full-automatic fire: Range 800/3,500, Wt. 8.9/1, RoF 13, Cost $850. It's license-made in Canada and Greece.

The *M16A4* (1999-) is a further updated model: Range 800/3,500, Wt. 8.9/1, RoF 9, Cost $950. Removing its carrying handle reveals an accessory rail (p. 161) for attaching an optical system. For instance, it can mount a 5-lb. 5× thermal sight (+2 Acc and Infravision, M/12 hrs.). It also features rails on the top, bottom, and sides of the forearm – beneath removable panels – to accommodate accessories. It has been the standard rifle of the USMC since 2001.

FN BAR Magnum, .300 Winchester Magnum (Belgium, 1967-)

The BAR – designed by John Browning's son, Val, and not to be confused with the Browning M1918 BAR (pp. 112-113) – is a semiautomatic, detachable-magazine hunting rifle, available in a variety of calibers.

Ruger Mini-14, .223 Remington (USA, 1973-2004)

The Mini-14 was a handy semiautomatic rifle based on the action of the Springfield M14 (p. 115). In the U.S., it was sold in large numbers to civilians – especially "survivalists" – and to law-enforcement agencies such as the NYPD and Texas Rangers. Alternative magazines took five ($26, 0.25 lb.), 30 ($29, 1.3 lbs.), or 50 rounds (-1 Bulk, $32, 2.2 lbs.). A 90-round drum was also available (-1 Bulk, $312, 3.6 lbs.).

The *AC-556* (1976-1994) was a selective-fire version offering single shots, three-round limited bursts, and full-automatic: RoF 9/12, Cost $790, LC2. It took the M16A1's 0.6-lb. knife bayonet (Reach 1). It was standard for the boys in the *A-Team*.

The *Muzzelite MZ-14* (1985-) is the AC-556 with a short barrel in an aftermarket plastic shell, converting it to a bullpup configuration without any gunsmithing required: Dmg 4d+2 pi, Acc 4, Range 430/2,700, Wt. 7/1, RoF 9/12, Bulk -4, Cost $750, LC2. This commercially available but futuristic-looking configuration was used in the movie *Total Recall*.

IMI Galil ARM, .223 Remington (Israel, 1974-)

In the early 1970s, Yisrael Galili adapted the basic Kalashnikov (p. 114) action to fire Western ammunition. The Israel Defense Forces adopted the resulting rifle. It has been widely exported, and is also produced in Colombia, Croatia, Serbia, and South Africa.

The Galil ARM features improved-visibility sights, a folding stock, and an integral bipod that can be used to cut barbed wire without dismounting it from the rifle (treat as wire cutters, p. 25). An extended 50-round magazine ($32, 2.3 lbs.) is available, allowing use as a squad automatic weapon. The gun takes the M16A1's 0.6-lb. knife bayonet (Reach 1).

The Galil ARM is also available in 7.62×51mm NATO (1976-), which isn't as popular: Dmg 7d pi, Acc 5, Range 1,000/4,200, Wt. 11.5/2, RoF 10, Shots 25+1(3), ST 10B†, Rcl 3, Cost $1,350/$32.

The *Galil SR* (1983-) is a semiautomatic sniper version in 7.62×51mm NATO, with 2-lb. 6× scope, bipod, and set trigger: Dmg 7d pi, Acc 5+2, Range 1,000/4,200, Wt. 15.6/1.6, RoF 3, Shots 20+1(3), ST 11B†, Bulk -6*, Rcl 3, Cost $5,600, LC3.

TsNIITochMash APS, 5.66×39mm (Russia, 1975-)

The *Avtomat Podvodniy Spetsialniy* ("special underwater assault rifle"), in service with the Russian naval SpetsNaz, is the world's only underwater assault rifle. It was a closely guarded secret until the 1990s. It has a smoothbore barrel and fires long, cavitation-stabilized darts (p. 169) with acceptable performance in air and reasonable results underwater. At the weapon's maximum operating depth of 130', multiply distance to the target by 25 – not by 1,000 – to see whether it's in range (see *Firing Underwater*, p. 85). Due to the long cartridges, the magazine is rather unwieldy. The APS has a retractable stock.

Steyr AUG A1, 5.56×45mm NATO (Austria, 1978-)

The *Armee-Universal-Gewehr* ("army universal rifle") was developed for the Austrian military, who adopted it as the StG77. A bullpup assault rifle, it's about 2/3 as long as more conventional patterns. Its distinctive, futuristic silhouette includes a trigger guard so big that the whole hand fits into it and a back-raked carrying handle with an integral 1.5× optical sight. The AUG feeds from 30-round magazines made of clear plastic – or, optionally, 42-rounders ($36, 1.5 lbs.). It has a progressive trigger (see *Automatic Weapons,* pp. 82-83).

The weapon's barrel can be exchanged quickly (six seconds), transforming it into any of several variants. These include a carbine with a 14" barrel (Dmg 4d+2 pi, Acc 4, Range 750/2,900, Wt. 8.1) and an automatic rifle with a 24" barrel and a bipod (Dmg 5d+1 pi, Range 850/3,600, Wt. 13.1/1.5, Shots 42+1, ST 9B†, Bulk -5). Treat the latter as a machine gun with a light barrel for the purpose of sustained fire (pp. 85-86). With a conversion kit, the AUG can fire 9×19mm Parabellum ammo instead: Dmg 3d-1 pi, Acc 4, Range 170/1,900, Wt. 8.4/1.1, Shots 25+1.

The AUG can be configured for left- or right-handed use with an Armoury (Small Arms) roll. It's too short for proper bayonet work (-2 to Spear skill), and the Austrian service model *can't* mount a bayonet. Some export versions accept a 0.6-lb. multi-purpose bayonet (Reach 1).

The AUG has been widely exported, and was also produced in Australia and Malaysia. Customers include several armies and police agencies. An early user on the big screen was the maniac Karl in *Die Hard.* Half a million have been made.

Enfield L85A1 IW, 5.56×45mm NATO (U.K., 1985-1994)

Also known as the SA80, the L85A1 Individual Weapon was a bullpup assault rifle adopted by the British Army. The gun performed well on the range in England (and was quite accurate) but abysmally under less-than-ideal conditions. After-action reports on its service during the 1991 Gulf War and other operations were bitter, citing frequent breaks, stoppages, and other malfunctions. Some 390,000 weapons were made.

The L85A1 uses detachable M16 magazines. It takes a 0.65-lb. multi-purpose bayonet (-2 to Spear skill, Reach 1) of cheap quality. The included 1-lb. tritium-illuminated 4× scope (+2 Acc and removes -2 from darkness penalties) is sometimes replaced by a 3.1-lb. 4× image-intensifying sight (+2 Acc and Night Vision 7, 2×XS/100 hrs.).

The *L86A1 Light Support Weapon* (1985-1994) was the squad automatic version, with a longer barrel and an integral bipod: Dmg 5d+1 pi, Range 850/3,600, Wt. 14.5, ST 9B†, Bulk -5, Cost $1,500. Treat it as a machine gun with a light barrel for the purpose of sustained fire (pp. 85-86).

The improved *L85A2* and *L86A2* (2001-2003) are more reliable (Malf. 17) and projected to stay in service until 2015.

Barrett M82A1, .50 Browning (USA, 1987-2002)

The Barrett "Light Fifty" is a heavy, recoil-operated gun. Its weight, action, and an excellent muzzle brake tame the recoil of the big .50 Browning to manageable proportions . . . but the shooter still has to fire it from the bipod while prone, or from a vehicle mount. The military employs it mainly for long-range sniping and the destruction of soft-skinned vehicles. It's also useful for the occasional shot at dinosaur.

The rifle is popular with civilian shooters and was adopted by most Western special-ops units. In 1991, the U.S. Marine Corps introduced it as the M82A1 Special Application Scoped Rifle (SASR). More than 10,000 were made.

The M82A1 lacks iron sights; to take advantage of its range, a powerful scope is necessary. The weapon table assumes a 2.1-lb. 10× scope, as used by the U.S. military. Since 1999, it can mount a 5.5-lb. 12.2× night sight (+3 Acc and Night Vision 7, 2×XS/10 hrs.). It normally fires match-grade ammo (+1 Acc) or APHEX rounds (Dmg 6d×2(2) pi with a 1d-2 [1d-2] cr ex follow-up).

The original *M82* (1985-1987) was used mostly by specialized long-range target shooters: Wt. 39/4.7, Shots 11+1, Cost $5,500. Only 115 were made.

The *M107* (2003-), adopted by the U.S. Army to replace earlier .50-caliber rifles, features such improvements as iron sights for backup, a full-length accessory rail (p. 161) on top, and a 1.4-lb. 4.5-14× variable scope: Wt. 32.6/4.1, Cost $14,800. It can be fitted with a 4.5-lb. sound suppressor (-4 to Hearing, -2 Bulk) and a 5.5-lb. 10× thermal sight (+3 Acc and Infravision, M/12 hrs.).

TsNIITochMash AS Val, 9×39mm (Russia, 1987-)

The *Avtomat Spetsialniy* ("special assault rifle") is based on the Kalashnikov (p. 114) action. Known as the *Val* ("Shaft"), it features a folding stock and a built-in baffle suppressor (-2 to Hearing), and fires a subsonic APHC round as standard. It's widely used by Russian special-ops units.

The *Vintovka Snayperskaya Spetsialniy* (1987-) or *VSS Vintorez* ("Thread-Cutter") is a "special sniper rifle" variant with a fixed skeleton stock and a 1.3-lb. 4× scope: Dmg 3d pi, Acc 5+2, Wt. 7.8/0.8, Shots 10+1(3), Bulk -5, Cost $1,000. It feeds from a 10-round magazine but can use the 20-round magazine of the AS, and vice versa. It fires a match-grade cartridge (included in Acc). The scope can be replaced by a 2-lb. 4× night sight (+2 Acc and Night Vision 6, XS/10 hrs.).

Accuracy International AW, 7.62×51mm NATO (U.K., 1990-)

The Accuracy International *PM* (1986-1990) was a modern bolt-action sniper rifle with synthetic stock, detachable 10-round magazine, folding bipod, set trigger, and 6× scope: Acc 6+2. Some 2,000 were made. In 1986, the British Army adopted it as the L96A1, replacing the Enfield L42A1 (see *Enfield SMLE Mk III,* p. 112).

The improved if basically similar AW sniper rifle appeared in 1990, developed in cooperation with the Swedish army. It features a 10× scope and a new barrel. It normally fires match-grade ammo (+1 Acc); the Swedes issue it with an APDS round (Dmg 9d(2) pi-, Range 1,500/6,300). The AW has been widely exported.

The *AWM* (1990-) is chambered for the .338 Lapua Magnum cartridge: Dmg 9d+1 pi, Acc 6+2, Range 1,300/5,500, Wt. 19.8/0.8, Shots 4+1(3), ST 12B†, Bulk -7, Cost $5,100. The British Army calls it the L115A1 Long-Range Rifle.

The AWM is also available in .300 Winchester Magnum, which is more popular than the larger caliber. The German

army adopted the *AWM-F* (1990-) – a variant with a folding stock and a 2-lb. 3-12× scope – as the G22: Dmg 8d+2 pi, Acc 6+3, Range 1,600/6,600, Wt. 20.1/0.8, Shots 5+1(3), ST 10B†, Bulk -7*, Rcl 2, Cost $5,800. It's issued with a detachable 2-lb. baffle suppressor (-3 to Hearing, -1 Bulk).

Colt M4A1, 5.56×45mm NATO (USA, 1994-)

By 1962, Colt had begun development of several short-barreled, telescoping-stock carbine versions of the AR-15 rifle (see *Colt M16A1,* p. 117) – weapons commonly known as the CAR-15. A few of these saw extensive service with special units during and after the Vietnam War, but it wasn't until 1994 that the U.S. Army finally adopted two variants with 14.5" barrels in large numbers. The M4A1 became the standard small arm for all U.S. military special-ops units, while the similar M4 – restricted to three-round limited bursts (RoF 9) – was acquired for light infantry, especially airborne troops. Since the late 1990s, American SWAT teams have used similar weapons extensively. The design has also been licensed to Canada and Greece.

Both M4 and M4A1 feature a detachable carrying handle with an accessory rail (p. 161) beneath. The two weapons take the M16A2's 1-lb. multi-purpose bayonet (Reach 1). They can mount a 0.5-lb. collimating sight (+1 skill, T/1,000 hrs.) or a 5-lb. 5× thermal sight (+2 Acc and Infravision, M/12 hrs.).

The *XM177E1 Commando* (1967-1968), with a 10.5" barrel, was widely used by U.S. Army special-ops units in Vietnam: Dmg 4d pi, Range 420/2,600, Wt. 6.8/0.7, Shots 20+1, Cost $650. The short barrel resulted in excessive muzzle blast (+2 to Hearing and Vision rolls to locate the weapon firing in the dark). Only 2,815 were made.

The *CAR-15A1 R653 Carbine* (1971-1984) had a 16.1" barrel: Range 460/2,900, Wt. 6.8/1, Cost $650. It was extensively exported, and licensed to the Philippines.

The *CAR-15 R6001 Sporter Carbine* (1978-1985) was a popular commercial variant with a 16.1" barrel: Range 460/2,900, Wt. 6.8/1, RoF 3, Cost $650, LC3.

The *CAR-15 R635 SMG* (1985-) is chambered in 9×19mm Parabellum: Dmg 3d-1 pi, Range 170/1,900, Wt. 7/1.3, Shots 32+1. Some U.S. police agencies acquired it.

The *CAR-15A2 R733 Commando* (1988-1996) had a 10.5" barrel: Dmg 4d pi, Range 600/2,500, Wt. 6.4/1. It features prominently in the bank robbery scene of the film *Heat*.

The *CAR-15A3 R6920 Government* (1994-) is a semiautomatic version of the M4 with a 16.1" barrel, widely used by U.S. police agencies: Wt. 7/1, RoF 3, LC3. Many manufacturers – including ArmaLite, Bushmaster, and S&W – make almost identical carbines.

Caseless-Ammo Rifles

Manufacturers try to introduce small arms that fire caseless ammo (pp. 164-165) at late TL6, but the first *successful* designs are TL8.

H&K G11, 4.73×33mm Dynamit-Nobel (Germany, 1990)

The revolutionary *Gewehr 11* was the culmination of more than 25 years of work and five decades of wishful thinking. Approved for service following successful field trials – making it the first small arm chambered for caseless ammo to achieve such approval – it never entered production, a victim of financial problems and the political situation after Germany's reunification. Fewer than 100 weapons reached various stages of development. The G11 was also one of several designs that competed unsuccessfully to become the U.S. military's Advanced Combat Rifle.

The G11 was a boxy bullpup, sheathed entirely in smooth, black plastic. It looked clumsy, but had good ergonomics and little recoil. When fired, the entire mechanism – including magazine, breech and barrel – would "float" back within the receiver, into the empty stock. The pistol grip, located at the center of gravity, had a knuckle-protecting loop. The 45-round magazine was inserted from the top front, parallel to the barrel, rounds pointing down. The revolutionary breech rotated each round 90°, aligning it with the barrel. Full-auto fire took advantage of the gun's light recoil and low cyclic rate (RoF 7), but the standard fire mode was three-round high-cyclic controlled bursts (p. 83).

The G11's detachable carrying handle had an integral 1× optical sight for quick target acquisition. This could be replaced with a night sight (p. 156). An attachment point below the gun's muzzle accepted a 1-lb. multi-purpose bayonet (-2 to Spear skill, Reach 1), a bipod, or a targeting laser.

The G11's "telescoped caseless" rounds consisted of projectiles encased in small, rectangular blocks of high explosive, and resembled orange wax crayons. The magazines were rather bulky. For this reason, rails mounted two magazines alongside the one in use. Additional ammo was to be issued in sealed, 15-round reload units, to refill the three magazines after they run dry. (Emptying a reload unit into a magazine requires three Ready maneuvers.)

Voere VEC91, 5.7×26mm Usel (Austria, 1991-)

The first small arm chambered for caseless ammunition actually to *enter* production, the VEC91 was intended for civilian hunters. It hasn't been very successful, being too expensive for the limited gain over more conventional guns. The weapon is a traditional bolt-action rifle with a wooden stock and a detachable box magazine . . . except for its electrically fired caseless ammo and the batteries in the stock (2×T/5,000 shots). The electric ignition guarantees instantaneous firing with no moving parts, increasing accuracy. It fires a hollow-point round as standard.

Muskets and Rifles Table

See pp. B268-271 for an explanation of the statistics.

GUNS (MUSKET) (DX-4 or most other Guns at -2)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
5	Brown Bess, .75 Flintlock	4d+2 pi++	2	100/1,100	10.2/0.09	1	1(40)	11†	-6	4	$100	3	[1]
5	North West Gun, .50 Flintlock	4d pi+	2	100/1,100	10/0.035	1	1(40)	10†	-6	4	$75	3	[1]
5	Charleville Mle 1777, 17.5mm Flintlock	4d+1 pi++	2	110/1,200	9.3/0.087	1	1(40)	10†	-7	4	$150	3	[2]

GUNS (RIFLE) (DX-4 or most other Guns at -2)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
5	Kentucky Rifle, .45 Flintlock	4d-1 pi+	3	110/1,200	7/0.025	1	1(60)	9†	-6	3	$350	3	[1]
5	Baker Rifle, .625 Flintlock	3d pi++	3	80/900	9/0.062	1	1(60)	9†	-6	3	$300	3	[1]
5	Hall M1819, .54 Flintlock	3d+1 pi+	3	90/1,000	10.3/0.044	1	1(5)	10†	-6	3	$330	3	[1]
5	Dreyse M.1841, 15.43×54mm	3d pi++	3	400/2,000	10.9/0.085	1	1(3)	10†	-6	3	$300	3	[1]
5	Enfield P/1853, .577 Caplock	3d+2 pi+	3	120/1,200	9.3/0.086	1	1(15)	10†	-6	4	$285	3	[1]
5	Volcanic, .38 Volcanic	2d-1 pi	2	70/800	8/0.45	2	25+1(3i)	8†	-5	2	$750	3	[1]
5	Spencer M1860, .56-56 Spencer	3d+2 pi+	3	180/2,000	8.8/0.5	1	7+1(16)	9†	-5	3	$450	3	
5	Remington Rolling Block, .45-70	5d pi+	4	470/3,000	9.2/0.086	1	1(3)	10†	-6	4	$650	3	
5	Martini-Henry Mk I, .450 MH	5d pi+	4	500/3,200	8.9/0.11	1	1(3)	10†	-6	4	$550	3	
5	Springfield M1873, .45-70	5d pi+	3	470/3,000	9.2/0.086	1	1(3)	10†	-6	4	$570	3	
5	Winchester M1873, .44-40	3d+1 pi+	3	300/2,200	8.9/0.6	2	15+1(2i)	9†	-5	2	$420	3	
5	Sharps Model 1874, .50-90	5d pi+	4	360/3,900	10.7/0.1	1	1(3)	11†	-6	4	$1,000	3	
5	Greener Elephant Rifle, 8-bore	6d+2 pi++	4	180/1,800	12/0.5	1	2(3i)	13†	-5	7	$3,000	3	[3]
6	Lebel Mle 1886, 8×50mmR	6d pi	5	900/3,900	10/0.5	1	8+2(3i)	10†	-6	4	$600	3	
6	Mosin-Nagant PV-1891, 7.62×54mmR	7d+1 pi	5	1,100/4,800	9.2/0.3	1	5(3)	10†	-6	4	$700	3	
6	Winchester M1894, .30-30	6d pi	5	900/3,700	7.2/0.3	2	5+1(2i)	9†	-5	3	$450	3	
6	Mauser Gew98, 7.92×57mm	7d+1 pi	5	1,100/4,600	9.5/0.3	1	5(3)	11†	-5	4	$900	3	
6	H&H Royal Double-Express, .600 NE	5d×2 pi++	5	800/4,600	16.4/0.4	1	2(3i)	14†	-7	7	$9,500	3	[3, 4, 5]
6	Remington Model 8, .35 Remington	5d+2 pi	5	800/3,500	7.9/0.3	3	5(3)	9†	-5	3	$800	3	
6	Springfield M1903, .30-06	7d+1 pi	5	1,100/4,500	8.8/0.3	1	5(3)	9†	-5	3	$900	3	
6	Arisaka Meiji 38 Shiki, 6.5×50mmSR	6d pi	5	600/3,200	9.4/0.3	1	5(3)	10†	-6	3	$700	3	
6	SMLE Mk III, .303	6d+2 pi	5	800/3,300	9.2/0.6	1	10(5)	10†	-5	3	$700	3	
6	Mauser T-Gew18, 13×92mmSR	5d×2(2) pi	5	2,100/8,800	40/0.26	1	1(3i)	16B†	-8	6	$10,000	1	[3]
6	Browning M1918 BAR, .30-06	7d+1 pi	5	1,100/4,500	17.1/1.6	9	20(3)	10†	-6	2	$2,300/$31	1	
6	Springfield M1 Garand, .30-06	7d+1 pi	5	1,100/4,500	10.1/0.5	3	8(3)	10†	-5	3	$510	3	
6	Winchester Model 70, .30-06	7d+1 pi	5	1,100/4,500	7.8/0.3	1	5(3i)	10†	-5	4	$750	3	
6	Steyr-Solothurn S18-1000, 20×138mmB	6d×2(2) pi++	5+1	2,100/8,000	117/12.1	1	10(5)	18B†	-11	3	$25,000/$62	1	[3]
6	Winchester M1, .30 M1	4d+1 pi	4	330/2,100	5.8/0.6	3	15+1(3)	8†	-4	2	$400/$27	3	
7	Rheinmetall FG42, 7.92×57mm	7d pi	5	1,000/4,200	11/1.8	15	20+1(3)	11B†	-5	3	$2,000/$31	2	
7	Haenel StG44, 7.92×33mm	5d pi	4	500/3,100	13.2/2	8	30(3)	9†	-5	2	$850/$31	2	
7	TOZ SKS-45, 7.62×39mm	5d+1 pi	4	500/3,100	8.9/0.4	3	10(3)	9†	-5	3	$350	3	
7	Izhmash AK-47, 7.62×39mm	5d+1 pi	4	500/3,100	11.3/1.8	10	30(3)	9†	-5	2	$450/$30	2	
7	FN FAL, 7.62×51mm	7d pi	5	1,000/4,200	11/1.7	11	20+1(3)	10†	-6	3	$1,200/$31	2	
7	Springfield M14, 7.62×51mm	7d pi	5	1,000/4,200	10.9/1.6	12	20+1(3)	10†	-5	3	$600/$31	2	
7	ArmaLite AR-7, .22 LR	1d+2 pi-	3	80/1,400	3.1/0.3	3	8+1(3)	7†	-4	2	$150/$25	3	[3]
7	Remington Model 700, 7.62×51mm	7d pi	5	1,000/4,200	7.8/0.3	1	5(3i)	11†	-5	4	$450	3	
7	Izhmash SVD, 7.62×54mmR	7d pi	5+2	1,000/4,200	10.1/0.7	3	10+1(3)	10†	-6	3	$900/$28	2	
7	H&K G3A3, 7.62×51mm	6d+2 pi	5	850/3,750	11.4/1.7	10	20+1(3)	10†	-5	3	$1,500/$31	2	
7	Marlin M444, .444 Marlin	7d-1 pi+	4	450/2,900	7.7/0.2	2	4+1(2i)	10†	-5	4	$650	3	
7	Colt M16A1, .223 Remington	5d pi	5	500/3,200	7.2/0.7	13	20+1(3)	8†	-5	2	$550/$34	2	
7	FN BAR Magnum, .300 WM	8d+1 pi	5	1,600/6,600	8.8/0.4	3	4+1(3)	10†	-6	4	$890	3	
7	AAI XM19, 5.6×57mmB	3d+1 pi-	5	750/4,700	7.4/1.5	9#/10	60+1(5)	8†	-5	2	$1,500/$255	2	
7	Ruger Mini-14, .223 Remington	5d pi	5	500/3,200	7.5/0.9	3	20+1(3)	8†	-5	2	$655/$28	3	
7	IMI Galil ARM, .223 Remington	5d-1 pi	4	480/3,000	11.3/1.8	11	35+1(3)	9†	-5*	2	$1,100/$30	2	
7	Izhmash AK-74, 5.45×39mm	4d+2 pi	4	440/3,000	9.1/1.2	11	30+1(3)	9†	-5	2	$400/$28	2	
7	TsNIITochMash APS, 5.66×39mm	5d imp	2	750/3,200	8.2/2.8	10	26+1(3)	9†	-5*	3	$750/$33	2	
8	Steyr AUG A1, 5.56×45mm	5d pi	5	800/3,500	9/1.1	11	30+1(3)	9†	-4	2	$1,250/$34	2	
8	Enfield L85A1, 5.56×45mm	5d pi	5+2	800/3,500	11.2/1	13	30+1(3)	9†	-4	2	$1,300/$34	2	[1]
8	Barrett M82A1, .50 Browning	6d×2 pi+	6+3	1,700/6,500	35/4.4	1	10+1(3)	13B†	-7	3	$7,775/$38	2	
8	TsNIITochMash AS Val, 9×39mm	3d(2) pi-	4	400/1,700	7/1.4	13	20+1(3)	8†	-5*	2	$750/$35	2	
8	AI AW, 7.62×51mm	7d pi	6+3	1,000/4,200	15/1	1	10+1(3)	11B†	-6	3	$4,700/$50	3	[4]
8	H&K G11, 4.73×33mm	4d+2 pi	5	500/3,000	9.3/1	9#/7	45+1(5)	9†	-4	2	$2,100/$32	2	[6]

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
8	Voere VEC91, 5.7×26mm	5d(0.5) pi+	5	480/3,400	6.2/0.2	1	5+1(3)	8†	-5	2	$2,500/$26	3	[6, 7]
8	Colt M4A1, 5.56×45mm	4d+2 pi	4	750/2,900	7.3/1	15	30+1(3)	9†	-4	2	$950/$34	2	[8]
8	H&K G36, 5.56×45mm	5d pi	5+1	800/3,500	9/1.1	12	30+1(3)	9†	-5*	2	$1,100/$34	2	[9]
8	NORINCO QBZ95, 5.8×42mm	5d pi	5	800/3,600	8.6/1.4	11	30+1(3)	9†	-4	2	$475/$34	2	
8	FN MK 16 MOD 0, 5.56×45mm	4d+2 pi	4	750/2,900	8/1	9	30+1(3)	9†	-4*	2	$1,500/$34	2	[8]

Notes:

[1] Unreliable. Malfunctions on 16+ (see p. B407).

[2] Very Unreliable. Malfunctions on 15+ (see p. B407).

[3] Lacks sling swivels (p. 154).

[4] Fine (accurate).

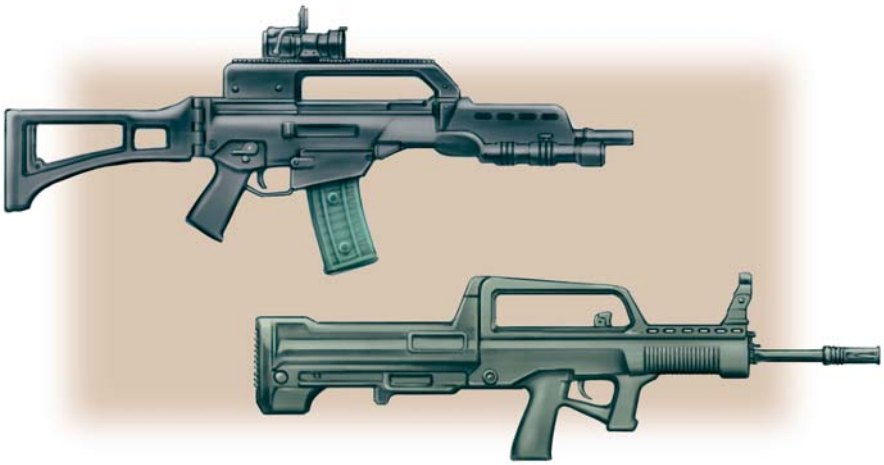
[5] Always decorated (see *Styling,* p. 10).

[6] Very Reliable. Won't malfunction unless lack of maintenance lowers Malf. (see p. B407).

[7] Needs power source (see description).

[8] Accessory rail (p. 161).

[9] Integral collimating sight (p. 156).



The *M4A1 SOPMOD* (1998-), used by special-ops units, is the M4A1 fitted with four accessory rails (p. 161) on the handguard: Wt. 7.6/1, Cost $1,200. It can use a 1.4-lb. baffle suppressor (-3 to Hearing, -1 Bulk).

The *MK 18 MOD 0* (2000-), adopted by the U.S. Navy SEALs and Coast Guard, is the M4A1 SOPMOD with a 10.3" barrel: Dmg 4d pi, Range 600/2,500, Wt. 6.8/1, Cost $1,200.

H&K G36, 5.56×45mm NATO (Germany, 1996-)

The *Gewehr 36* is the latest assault rifle of the German military. It has a folding stock and a conventional layout, kept light and rugged by the extensive use of synthetics. It uses translucent plastic magazines (which can be clipped side-by-side, p. 155), and takes the AK-74's 0.6-lb. multipurpose bayonet (Reach 1). A quick-detachable 0.5-lb. bipod is available. The G36 is widely exported, and is produced under license in Spain.

A unique feature of the G36 is its dual optical sights: it has a non-magnifying collimating sight for snapshots at short range (+1 skill, XS/60 hrs.), below which is an integral 3× scope for aimed shots at longer distances (+1 Acc). A 2.6-lb. add-on night sight (Night Vision 7, 2×S/90 hrs.) or a 5.5-lb. add-on thermal sight (Infravision, 6×S/12 hrs.) can be attached in front of the scope. Only the scope is functional while these additions are in place, as the collimating sight is obstructed. Variants have open sights and an accessory rail (p. 161) instead of the optics.

German and other special-ops units, as well as some American SWAT teams, use the *G36K* (1997-) assault carbine, which has a shortened barrel: Dmg 4d+2 pi, Acc 4+1, Range 650/2,700, Wt. 8.3/1. It can be fitted with a 1.4-lb. baffle suppressor (-3 to Hearing, -1 Bulk). Variants have an accessory rail instead of the sights.

Even more compact, the *G36C* (2001-) approaches a submachine gun in handiness: Dmg 4d pi, Acc 4, Range 600/2,500, Wt. 7.2/1, Bulk -4*, Cost $1,200. It features an accessory rail instead of the dual optics.

NORINCO QBZ95, 5.8×42mm (China, 1997-)

The *95 Shi Zidong Buqiang* ("automatic rifle type 1995"), or QBZ95, is the latest Chinese service rifle. A bullpup design with a large carrying handle, it's chambered for a unique round and offers three-round limited bursts in addition to semi- and full-automatic fire. It takes the M16A2's 1-lb. multi-purpose bayonet (-2 to Spear skill, Reach 1) and can be fitted with a 1-lb. 3× scope (+1 Acc).

The *QBZ95B* (1997-) carbine variant has a 12.8" barrel: Dmg 4d+1 pi, Acc 4, Wt. 7.8/1.4, Bulk -3. The *QBB95* (1997-) is an automatic rifle with 21.9" barrel, bipod, and 75-round drum: Dmg 5d+1 pi, Wt. 11.4/2.9, Shots 75+1(5), ST 9B†, Bulk -5. Treat the latter as a machine gun with a light barrel for the purpose of sustained fire (pp. 85-86).

FN MK 16 MOD 0, 5.56×45mm NATO (Belgium, 2006-)

The Special Operations Forces Combat Assault Rifle (SCAR) is a new family of rifles for the U.S. Special Operations Command (SOCOM). The basic weapon – the *SCAR Light* or *SCAR-L* – has a 13.8" barrel, an adjustable folding stock, an optional 0.5-lb. collimating sight (+1 skill), and accessory rails (p. 161). *All* variants can be fitted with a 1-lb. sound suppressor (-3 to Hearing, -1 Bulk).

The *MK 16 MOD 0 Close Quarters Carbine* (CQC) has a 10" barrel: Dmg 4d pi, Range 600/2,500, Wt. 7.7/1.

The *MK 16 MOD 0 Sniper Variant* (SV) has an 18" barrel, and a detachable 1-lb. 4× scope replaces the collimating sight: Dmg 5d pi, Acc 5+2, Range 800/3,500, Wt. 9.6/1, Bulk -5*.

The *MK 17 MOD 0* or *SCAR-H* is the basic rifle chambered in 7.62×51mm NATO: Dmg 6d pi, Range 800/3,500, Wt. 8.8/1.6, Shots 20+1, ST 10†, Bulk -5*, Rcl 3.

The *MK 17 MOD 0 CQC* has a 10" barrel: Dmg 5d+1 pi, Range 700/3,000, Wt. 8.4/1.6, Shots 20+1, ST 10†, Rcl 3.

The *MK 17 MOD 0 SV* has a 19.7" barrel, and a detachable 1-lb. 4× scope replaces the collimating sight: Dmg 7d pi, Acc 5+2, Range 1,000/4,200, Wt. 10.2/1.6, Shots 20+1, ST 10†, Bulk -5*, Rcl 3.

Submachine Guns

The submachine gun (SMG) is a TL6 development inspired by trench warfare, intended to give infantry a light automatic weapon for close-quarters combat. Like the pistol-carbine, the immediate forerunner of the SMG, the SMG uses low-powered rounds. This keeps weight down and allows accurate close-range fire. The SMG was initially dismissed as a weapon fit only for police and gangsters. By late TL6, it's an important military small arm, invaluable for house-to-house fighting and jungle warfare, and issued to airborne troops and vehicle crews.

Starting in early TL7, the assault rifle slowly replaces the SMG as a military weapon. The SMG continues to see widespread service into TL8 with police and security forces, however. Submachine guns at TL8 largely resemble the original archetypes but use lighter materials, offer better ergonomics, and have a wider selection of accessories.

A uniquely TL8 innovation is the personal defense weapon (PDW). Similar to the SMG in size and use, the PDW was developed in response to body armor, its high-velocity, small-caliber rounds offering increased penetration.

Bergmann MP18/I, 9×19mm Parabellum (Germany, 1918)

The *Maschinenpistole Modell 1918/I* was the first SMG in form and function, and the earliest to see substantial use. The German army introduced it in WWI, and most other SMGs of the 1920s and 1930s were based on it. The original weapon employed the 32-round "snail-drum" magazine developed for the Luger LP08 pistol-carbine (see *Luger P08,* p. 98), inserted from the left-hand side. After WWI, the guns were rebuilt to take conventional box magazines holding 20 ($28, 1 lb.) or 32 rounds ($29, 1.5 lb.); this improves Malf. to 17. Some 35,000 were made, and German police were issued the MP18/I until the end of WWII.

The gun's designer, Hugo Schmeisser, developed it into the Haenel *MP28/II* (1928-1938), capable of selective fire and using 32-round box magazines: Wt. 10.3/1.5, Shots 32, RoF 8. An optional 50-round magazine ($32, 2.3 lbs.) was available. Users included Belgium, Bolivia, Ecuador, Paraguay, and the *Waffen-SS.* Many were exported to China in 7.63×25mm Mauser (Dmg 3d pi-, Wt. 10.2/1.4, RoF 10), while Spain bought it in 9×23mm Bergmann-Bayard (Wt. 10.3/1.5, RoF 8).

Early in WWII, George Lanchester of Sterling Armaments (England) made some cosmetic changes to the MP28/II. The Royal Navy adopted his version in 9×19mm Parabellum as the *Lanchester Mk I* (1941-1943): Wt. 11.9/2.3, RoF 10, Shots 50. The *Lanchester Mk I Star* (1943), in use until the 1960s, could only fire full-automatic (RoF 10!). Some 80,000 were made in England, and more in India. The Lanchester took the SMLE rifle's 1.3-lb. sword bayonet (Reach 1).

Auto-Ordnance M1921, .45 ACP (USA, 1921-1928)

General John Thompson – who coined the term "submachine gun" – began designing his famous weapon during WWI, but it wasn't completed until 1921. The "Tommy gun" was adopted by the U.S. Coast Guard, prison guards, and the police departments of most major American cities. U.S. Marines employed a few hundred guns in China, Nicaragua, and at home (to protect mail trains). In the hands of such high-profile criminals as Al Capone and John Dillinger, it became known as the weapon of mobsters and bank robbers – the "Chicago Piano" or "Chopper." The IRA used the Thompson in their fight against the British. Small numbers were exported to police forces such as the Royal Canadian Mounted Police and the Shanghai Police. Only 15,000 were made, but it was widely copied in China from the late 1920s.

The original M1921 had excellent sights and was quite accurate. It could use both box and drum magazines. The box held 20 rounds ($30, 1.3 lbs.); the drum, either 50 rounds (in table) or 100 rounds (Malf. 16, -1 Bulk, $274, 8.5 lbs.). It was typically sold with four 20-rounders and a 50-round drum. An 18-round magazine ($30, 1.2 lbs.) was made for use with a birdshot round for riot control: Dmg 1d-3(0.5) pi-, Range 12/230, RoF 13×120, Shots 18+1(3), Rcl 1. Without the detachable 1.75-lb. shoulder stock, the Thompson could be concealed in a violin case or under a coat: Acc 3, ST 12†, Bulk -4, Rcl 3.

The *M1928* (1928-1938), designed for the U.S. Navy, had a reduced cyclic rate: RoF 11. The FBI officially adopted it in 1935.

The simplified *M1928A1* (1938-1942) was finally adopted in large numbers by the British and U.S. military: Acc 3, Wt. 12/1.3, RoF 11, Shots 20+1(3). Some were delivered to France, Sweden, and Yugoslavia before WWII. Almost 600,000 were made, most for the British.

The first Thompson to see widespread service with the U.S. military was the *M1* (1942-1943), further simplified for wartime production and issued with a 30-round magazine: Acc 3, Wt. 12.2/1.6, RoF 11, Shots 30+1(3), Cost $750/$32. It lacked the foregrip and couldn't use drums, and the butt stock was no longer removable. The similar *M1A1* (1942-1944) superseded the M1. Over 824,000 M1 and M1A1s were made and widely exported.

Production resumed in 1975, but most new weapons are semi-auto only and fitted with lengthened barrels to comply with U.S. laws. The *M1927A-1* (1975-) has Dmg 2d+2 pi+, Range 160/1,800, Wt. 12.6/1.6, RoF 3, Shots 30+1(3), Cost $1,150/$32, LC3.

Tikkakoski KP/31 Suomi, 9×19mm Parabellum (Finland, 1931-1944)

This accurate, well-made, and reliable SMG was called the *Suomi* ("Finland") by its designer Aimo Lahti. The Finnish army standardized it as the *Konepistooli malli 1931* ("submachine gun model 1931"). During WWII, it was exported to Bulgaria and Croatia. German *Waffen-SS* units and Hitler's bodyguards also used it. Some 62,000 were produced, and it was license-made in Denmark, Sweden, and Switzerland.

The H&K MP5

In 1966, West German police and border guards adopted the *Maschinenpistole 5* – the fifth submachine gun to enter official service with German forces after WWII. It was the main weapon of the famous GSG9 antiterrorist unit from its inception. The MP5 first caught the public eye as the gun used by the British SAS during the Iranian embassy siege of 1980. It soon became the firearm of choice among special operators everywhere. Today, virtually all Western (and quite a few Eastern) special-ops, counterterrorist, and SWAT teams employ the MP5.

Several factors explain the MP5's popularity despite its high price tag. It's reliable and extremely versatile. Its closed-bolt action makes it probably the most accurate weapon of its type. Dozens of sub-variants exist, and there are few firearms with so many accessories offered. Finally, a certain air of professionalism surrounds it – if GSG9 and the SAS use it, it *must* be good. The MP5 has been license-made in Greece, Iran, Mexico, Norway, Pakistan, Saudi Arabia, Turkey, and the U.K.

H&K MP5A3, 9×19mm Parabellum (Germany, 1971-)

The original *MP5* (1966-1971) had a fixed plastic stock and a straight magazine (Wt. 6, Bulk -4). The *MP5A1* (1966-1971) had *no* stock (Acc 3, Wt. 5.3, Bulk -3).

The *MP5A2* (1971-) is slightly improved over the MP5 (but still Wt. 6, Bulk -4). It and the MP5A3 (in table), which has a retractable stock, are the main production models today.

The *MP5A4* (1982-) has a fixed stock like the MP5A2, but offers a three-round limited burst option in addition to semi- and full-automatic (RoF 9/13). The *MP5A5* (1982-) is like the MP5A4, but with a retractable stock.

The *MP5N* (1985-) was originally ordered by the U.S. Navy SEALs. It resembles the MP5A3 but features a new ambidextrous grip configuration, and muzzle lugs for the quick attachment of a 1.2-lb. baffle suppressor (-2 to Hearing, -1 Bulk). A 100-round twin drum (-1 Bulk, $313, 4.8 lbs.) became available in 2001.

The MP5 is also available in other calibers. In 1994, the FBI adopted the *MP5/10A3* (1992-1999), in 10×25mm Auto: Dmg 3d+2 pi+, Range 280/3,100, Wt. 7.8/1.5, RoF 6/13, ST 9†, Rcl 3. The *MP5/40A3* (1992-1999), in .40 S&W, was somewhat more popular: Dmg 3d-1 pi+, Range 190/2,000, Wt. 7.6/1.3, RoF 6/13. Both normally fired single shots, two-round limited bursts, and full-automatic.

H&K MP5SD3, 9×19mm Parabellum (Germany, 1974-)

The MP5 *Schalldämpfer* has an integral sound suppressor (-3 to Hearing) that lasts for some 10,000 shots. The *MP5SD1* lacks a stock (Acc 3, Wt. 7.3, Bulk -3), the *MP5SD2* has a fixed stock (Wt. 8, Bulk -4), and the MP5SD3 (in table) has a retractable stock. The *MP5SD4, MP5SD5,* and *MP5SD6* (all available from 1982) add a three-round limited-burst option (RoF 9/13) but are otherwise identical to the MP5SD1, MP5SD2 and MP5SD3, respectively.

H&K MP5K, 9×19mm Parabellum (Germany, 1976-)

The MP5 *Kurz* is a shortened machine-pistol variant designed for concealed carry under a coat. It lacks a stock but features a foregrip for better two-handed control. If fired *one-handed:* ST 11, Rcl 3. A 15-round magazine was designed to accompany it ($27, 0.7 lb.), but the standard 30-rounder is more common.

The *MP5KA1* (1976-) has only rudimentary sights (Acc 1, Bulk -2, +1 to Fast-Draw). The *MP5KA4* and *MP5KA5* (1982-) offer three-round limited bursts (RoF 9/13). The *MP5K-PDW* (1991-) is similar to the MP5K, but has the MP5N grip and a folding stock (Acc 3, Wt. 6.2, Bulk -4*), and accepts the MP5N's suppressor.

A special attaché case (p. 31) is available that can mount any MP5K model *inside* ($3,000, 14.9 lbs. with gun and spare magazine). A trigger in the carrying handle lets the carrier fire the weapon while it's still in the case. This gives -4 to Guns skill – and unless the shooter employs the proper technique, with the case braced against his midsection, Rcl rises to 3.

Submachine Guns Table

See pp. B268-271 for an explanation of the statistics.

GUNS (SMG) (DX-4 or most other Guns at -2)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
6	Bergmann MP18/I, 9×19mm	3d-1 pi	3	170/1,900	11.5/2.4	8!	32(5)	9†	-5	2	$1,500/$255	2	[1]
6	Auto-Ordnance M1921, .45 ACP	2d+1 pi+	4	160/1,700	15.7/4.9	13	50+1(5)	10†	-5	2	$2,300/$262	2	
6	Tikkakoski KP/31, 9×19mm	3d-1 pi	4	180/2,000	15.6/4.5	15	70(5)	10†	-5	2	$1,600/$260	2	
7	ERMA MP40, 9×19mm	3d-1 pi	3	170/1,900	10.5/1.5	8!	32(3)	9†	-5*	2	$400/$29	2	
7	ZiD PPSh-41, 7.62×25mm	3d pi-	3	200/2,200	11.7/4	16	71(5)	9†	-5	2	$200/$260	2	[1]
7	Enfield Sten Mk II, 9×19mm	3d-1 pi	3	170/1,900	7.9/1.4	9	32(3)	8†	-4	2	$135/$29	2	[1]
7	Guide Lamp M3, .45 ACP	2d+1 pi+	3	160/1,700	10.2/2.2	7!	30(3)	9†	-5*	2	$350/$37	2	
7	Sterling L2A3, 9×19mm	3d-1 pi	3	170/1,900	7.6/1.6	9	34(3)	8†	-4*	2	$550/$29	2	
7	CZ Sa vz. 61 Skorpion, .32 ACP	2d-1 pi-	2	90/1,000	3.7/0.9	14	20(3)	7†	-3*	2	$350/$27	2	
7	IMI Uzi, 9×19mm	3d-1 pi	3	170/1,900	8.8/1.1	10	25(3)	9†	-4*	2	$600/$28	2	
7	MAC-Ingram M10, 9×19mm	2d+2 pi	3	130/1,400	7.5/1.3	18	32(3)	8†	-3*	2	$425/$29	2	
7	H&K MP5A3, 9×19mm	3d-1 pi	4	170/1,900	7.5/1.2	13	30+1(3)	8†	-4*	2	$1,500/$29	2	
7	H&K MP5SD3, 9×19mm	2d pi	4	120/1,400	8.7/1.2	13	30+1(3)	8†	-4*	2	$2,400/$29	2	
7	H&K MP5K, 9×19mm	2d+2 pi	2	160/1,800	5.6/1.2	15	30+1(3)	9†	-3	2	$1,400/$29	2	
8	FN P90, 5.7×28mm	3d-1(2) pi-	4	180/1,900	6.6/1	15	50+1(5)	8†	-3	2	$1,650/$55	2	[2]
8	Steyr TMP, 9×19mm	2d+2 pi	2	160/1,800	3.8/1	15	30+1(3)	8†	-2	2	$1,200/$34	2	
8	Izhmash PP-19 Bizon-2, 9×18mm	2d pi	3	120/1,300	7.4/2.25	11	64(5)	8†	-4*	2	$450/$305	2	
8	H&K UMP, .45 ACP	2d+1 pi+	3	160/1,700	6.5/1.6	10	25+1(3)	8†	-4*	2	$900/$36	2	[3]
8	TsNIITochMash SR-2 Veresk, 9×21mm	3d-1(2) pi-	3	170/1,800	4.8/1.2	15	30+1(3)	8†	-4*	2	$750/$29	2	[3]
8	H&K MP7A1, 4.6×30mm	4d+1 pi-	4	180/1,900	4.4/0.5	15	20+1(3)	7†	-3*	2	$1,500/$26	2	[3]

Notes:

[1] Unreliable. Malfunctions on 16+ (see p. B407).

[2] Integral reflex sight (p. 156).

[3] Accessory rail (p. 161).

The KP/31 originally came with a 20-round box magazine ($28, 1.3 lbs.) or a 40-round drum ($255, 3.1 lbs.). In 1936, the famous 70-round drum was adopted (in table). A Swedish 50-round high-density magazine ($34, 2.6 lbs.) became available in 1941.

ERMA MP40, 9×19mm Parabellum (Germany, 1940-1944)

In 1938, the German military adopted the *Maschinenpistole Modell 1938* (1939-1941), or MP38, which introduced several firsts – including a folding metal stock and the use of significant amounts of plastic. Originally intended for parachutists and tank crews, fewer than 9,000 were in service by the start of WWII. It was soon issued on a much wider scale, with at least each infantry squad leader receiving one.

The improved MP40, perhaps the most recognizable German weapon of WWII, superseded the MP38. It featured stamped rather than milled steel components, and a safeguard against accidental discharge – unlike the MP38, which was prone to start firing when dropped or struck hard (roll 3d; on 17-18, it starts firing and doesn't stop until the magazine is empty!). One million were made. Post-war, it was copied in Spain and Yugoslavia.

The MP40 entered Anglo-American folklore as the "Schmeisser," even though Hugo Schmeisser had nothing to do with it; in fact, he worked for an entirely different company. The weapon continued to appear for a long time after WWII in irregular warfare. Both the Viet Cong and U.S. Army Special Forces used it in Vietnam. It saw considerable use with criminals – including many villains in James Bond movies.

ZiD PPSh-41, 7.62×25mm Tokarev (Russia, 1941-1947)

With its drum magazine and distinctive perforated barrel jacket, the *Pistolet-Pulemet Shpagina obrazets 1941g* ("Shpagin's submachine gun model 1941") – or "Peh-Peh-Shah," as the Americans called it during the Korean War – was the distinguishing feature of Communist armies until the early 1960s. The Soviet Union made 5.4 million weapons and distributed them widely to its allies and to Communist guerrillas. More were produced in China, Hungary, Iran, North Korea, Poland, Romania, and Yugoslavia.

In WWII, the Soviets armed entire infantry battalions with nothing but PPSh-41s. These troops were assigned directly to tank units. They rode on the outside of the tanks, clinging to handles welded to the armor. It must have been a truly delightful way to fight, especially in a Russian winter.

In 1943, a 35-round curved magazine superseded the 71-round drum magazine (copied from the KP/31, pp. 122, 124). This was cheaper, lighter, quicker to fill, and less prone to jamming (Malf 17., $29, 1.5 lbs.). The PPSh-41 was often issued with API ammo (Dmg 2d(2) pi- inc). While cheaply made, the PPSh-41 has an outstanding reputation for ruggedness (HT 12).

Enfield Sten Mk II, 9×19mm Parabellum (U.K., 1942-1945)

In 1941, the British were desperate for arms. Two engineers at the Royal Small Arms Factory, Enfield – Shepherd and Turpin – designed an SMG that could be produced quickly and cheaply. It was called the STEN,

from their initials and the first two letters of Enfield. Its name and its "cheap and nasty" appearance led to nicknames like "Stench Gun," "Woolworth Gun," and "Plumber's Delight." The most numerous variant was the Sten Mk II, introduced in 1942. Over two million Mk IIs were made – about half of the total Sten production.

The Sten was plagued with reliability problems. Most could be traced to the magazine (inserted from the left), which was poorly designed and badly made. Even the manufacturer recommended loading it with only 28 rounds for more reliable feeding. Experienced soldiers would look over all the available magazines to select a few that worked. The GM might raise Malf. for veterans who get the opportunity to do this (make a successful Soldier roll).

The original *Sten Mk I* (1941-1942) had a folding wooden foregrip: Wt. 8.6. Some 100,000 were made.

The *Sten Mk IIS* (1943-1945) was a variant with an integral sound suppressor (-2 to Hearing): Dmg 2d pi, Range 120/1,400, Wt. 9.1, Bulk -5, Cost $425. As the suppressor would wear out after a single magazine of full-automatic fire, burst-fire was discouraged. Carefully aimed single shots could extend suppressor life to several *hundred* rounds. The Sten Mk IIS was the most numerous sound-suppressed weapon of WWII; 5,776 were made. British Commando and American OSS units employed it, and German special-warfare forces used all they could capture.

The British, Canadians, and New Zealanders manufactured a lot of Stens, as did others – including resistance movements in Denmark, France, the Netherlands, Poland, and Vietnam. It was also made by the Jewish *Haganah* in Palestine . . . and even in Germany, for the last defense during WWII (for use with MP40 magazines!). The simple design lent itself to production with few tools.

Guide Lamp M3, .45 ACP (USA, 1943-1945)

This cheap, simple weapon succeeded the Thompson (see *Auto-Ordnance M1921,* p. 122). Nicknamed the "Grease Gun" due to its likeness to the mechanic's implement, it was made of stamped steel (its chief manufacturer made automobile headlights during peacetime) and had a retractable wire stock. Widely exported after WWII, it saw heavy use in Korea and Vietnam. It was obsolete by the 1960s but served as a tank-crew weapon until the 1990s, when the U.S. Army finally replaced it with the Colt M4 (pp. 119-121). More than 606,000 were produced.

About 1,000 were fitted with an integral sound suppressor (-2 to Hearing), for use by OSS agents: Dmg 2d pi+, Range 110/1,200, Wt. 11.6, Cost $600. Most saw action in the Far East and the Pacific.

Sterling L2A3, 9×19mm Parabellum (U.K., 1956-1988)

The Sterling was the British military's standard SMG until the Enfield L85A1 assault rifle (p. 118) replaced it. More than 400,000 were produced in England and widely exported as the Mark 4. It was also made under license in Canada and India. It had a folding stock and a curved magazine inserted from the left-hand side. A smaller, 15-round magazine was also available ($27, 0.8 lb.). Most people know the Sterling best as the basis of the Stormtrooper blasters in *Star Wars!*

The *L34A1* (1966-1988) featured an integral sound suppressor (-3 to Hearing): Dmg 2d pi, Range 120/1,400, Wt. 9.5, Bulk -5*, Cost $920. Exported as the Mark 5, it saw extensive use. Australian and U.S. special-ops troops used it in Vietnam, and both Argentine and British special-ops forces used it in the Falklands War.

The *Mark 7A4* (1972-1988) "paratrooper's pistol" was a short machine pistol that lacked the stock: Dmg 2d+2 pi, Acc 2, Range 160/1,800, Wt. 6.4/1.6, RoF 10, ST 7, Bulk -3. If using the 15-round magazine: Wt. 5.6/0.8, Shots 15(3), Bulk -2. The *Mark 7C4* was the same weapon limited to semiautomatic fire (RoF 3).

CZ Sa vz. 61 Skorpion, .32 ACP (Czechoslovakia, 1962-1979)

The *Samopal vzór 61 Skorpion* ("automatic gun model 1961 Scorpion") was a compact machine pistol designed to be worn as a holstered sidearm by tank crews, paratroops, and secret police who desired more firepower than a pistol could provide. Production ceased after 210,000 were made. Widely exported, it showed up in the hands of revolutionaries and terrorists worldwide. It was also manufactured under license in Yugoslavia.

The Skorpion had a folding stock and an optional 10-round magazine ($26, 0.4 lb.). If fired *one-handed* with stock folded: ST 8, Rcl 3. It could be fitted with a 0.6-lb. wiper suppressor (-1 to Hearing, -1 Bulk, lasts for 40 shots), reducing Dmg to 1d+2 pi-.

Sally Sweet: I like the Uzi better, anyway. It looks better with the dress. The AK seems too casual to me.

Stephanie Plum: It's important to accessorize properly.

– Ten Big Ones

IMI Uzi, 9×19mm Parabellum (Israel, 1967-2004)

The Uzi – named after its inventor, Uziel Gal – was the foundation of the Israeli small-arms industry. The original version, with a fixed wooden stock, appeared in 1955. IMI produced more than two million. It was also license-made in Belgium and South Africa, and copied in Burma, China, and Croatia. Armies and police forces worldwide adopted the Uzi; the U.S. Secret Service used it from 1967 until the 1990s.

At just over 2' with its wooden stock, the Uzi was compact: Wt. 9, Bulk -4. From 1967, the standard version (in table) had a folding stock. The weapon was less than 18" long with the stock folded. If fired *one-handed* this way: ST 11, Rcl 3.

The Uzi's original magazine took 25 rounds, but 32-round ($29, 1.3 lbs.) and 20-round ($28, 0.9 lb.) versions soon appeared. Its threaded muzzle could be fitted with a 1-lb. baffle suppressor (-2 to Hearing, -1 Bulk). The gun also accepted a scarce 0.5-lb. knife bayonet (-2 to Spear skill, Reach 1).

The Uzi was available in .45 ACP (1987-1998) as well: Dmg 2d+1 pi+, Range 150/1,700, Wt. 8.9/1.2, RoF 8, Shots 16. A 20-round magazine weighed 1.4 lbs.

A semiautomatic *Uzi Carbine* (1980-2004), with a 16" barrel, was for sale in the U.S.: Dmg 3d pi, Acc 4, Range 200/2,200, Wt. 9.5/1.1, RoF 3, Shots 25+1(3), Bulk -5*, Cost $1,000, LC3.

The *Mini-Uzi* (1980-), designed for vehicle crews and commandos, is only 14" long with stock folded: Dmg 2d+2 pi, Wt. 7/1.1, RoF 15, Cost $900.

The *Micro-Uzi* (1982-) is even smaller, at 10" with stock folded: Dmg 2d+2 pi, Range 160/1,800, Wt. 5.2/0.9, RoF 28, Shots 20(3), ST 7†, Bulk -3*, Cost $900. If fired *one-handed* with stock folded: Acc 2, ST 8, Rcl 3.

The *Uzi Pistol* (1983-1994) was a stockless semiautomatic variant of the Micro-Uzi: Dmg 2d+2 pi, Acc 2, Range 160/1,800, Wt. 4.7/0.9, RoF 3, Shots 20+1(3), ST 10, Bulk -2, Cost $900, LC3.

MAC-Ingram M10, 9×19mm Parabellum (USA, 1970-1976)

Gordon Ingram designed his Model 10 as the first really *compact* American SMG. Its initial manufacturer was the Military Armaments Corporation (MAC), hence it was also known as the "MAC-10." It didn't meet with much success, and only 16,000 were made. Its distinctive silhouette made it a favorite cinematic weapon (the sour joke was that all the production went to Hollywood).

The M10 was small enough to carry in a belt holster or a shoulder sling under a coat. If fired *one-handed* with the stock retracted: Acc 2, ST 10, Rcl 3. The barrel was threaded to take a 1.2-lb. baffle suppressor (-2 to Hearing, -1 Bulk).

From 1977-1994, the M10 was available in semiautomatic versions. These were easy to convert to selective fire; make an Armoury (Small Arms) roll at +4 or an IQ-based Guns roll. The semiautomatics were far more successful, with half a million being made under various trade names, including Cobray.

A rarer version of the M10 was made in .45 ACP: Dmg 2d+1 pi+, Range 140/1,500, Wt. 8.4/2.2, RoF 19, Shots 30(3).

The *M11* (1970-1976) was even smaller, and chambered in .380 ACP: Dmg 2d-1 pi, Range 110/1,100, Wt. 4.6/1.1, RoF 26, ST 7†. A 16-round magazine weighed 0.6 lb.; a suppressor, 1 lb.

FN P90, 5.7×28mm (Belgium, 1991-)

The innovative P90 PDW is compact and handy, combining a bullpup configuration with a top-mounted magazine that runs parallel to the barrel; its ergonomic grip encloses the trigger hand. Over 17,000 have been made. Users include special-ops forces, SWAT teams, and the U.S. Secret Service. It also features prominently in the *Stargate SG-1* TV series. The P90 has an integral collimating sight (+1 skill), fires an AP round as standard, and accepts a 1.2-lb. baffle suppressor (-3 to Hearing, -1 Bulk).

The *P90TR* (1999-) replaces the integral sight with three accessory rails (p. 161) on the top and sides.

The *PS90* (2006-) is a semiautomatic civilian version with a longer (16.1") barrel, firing normal bullets: Dmg 4d pi-, Range 200/2,200, Wt. 7/0.7, Shots 30+1(3), Cost $1,400/$32, LC3. With the restricted AP ammo, it does 3d(2) pi-. It can also use the P90's 50-round magazines.

Steyr TMP, 9×19mm Parabellum (Austria, 1993-2001)

The *Taktische Maschinenpistole* ("tactical machine pistol") was a light, sleek weapon resembling a large pistol with a foregrip. At 12" overall length, it was easy to conceal, and several units adopted it for bodyguard duties. If fired *one-handed:* ST 10, Rcl 3. With a 15-round magazine: Wt. 3.4/0.5, Shots 15+1(3).

Izhmash PP-19 Bizon-2, 9×18mm Makarov (Russia, 1997-)

The *Pistolet Pulemet-19 Bizon-2* ("submachine gun model 19 Bison-2") is based on Kalashnikov components. It features a folding stock and a 64-round helical drum magazine below and parallel to the barrel. Russian police and interior troops use it – often loaded with APHC ammo (Dmg 2d(2) pi-).

The *Bizon-2-01* (1996-) is the same gun in 9×19mm Parabellum: Dmg 3d-1 pi, Range 170/1,900, Wt. 8/2.2, RoF 12, Shots 53(5).

H&K UMP, .45 ACP (Germany, 1999-)

The *Universal-Maschinenpistole* ("universal submachine gun") was designed specifically for American SWAT teams, and has been widely exported. The UMP is a light blowback weapon with mostly synthetic components. It has a folding stock and integral accessory rails (p. 161) around the barrel and on the receiver. It's also available in .40 S&W: Dmg 3d-1 pi+, Range 190/2,000, Wt. 6/1.4, RoF 12, Shots 30+1(3). Guns in either caliber accept a 0.8-lb. baffle suppressor (-2 to Hearing, -1 Bulk).

TsNIITochMash SR-2 Veresk, 9×21mm Gyurza (Russia, 1999-)

The SR-2 Veresk ("Heather") was designed to go with the SR-1 Gyurza pistol (p. 102), and fires the same APHC bullet. It's a compact weapon with the magazine in the grip, a folding stock, and an accessory rail (p. 161) on the receiver. Its main users are Russian intelligence services and SWAT units.

H&K MP7A1, 4.6×30mm (Germany, 2002-)

This ambidextrous PDW was adopted by German and other special-ops units. It resembles a large, black-plastic pistol with the magazine in the grip, a retractable stock, and a folding foregrip. If fired *one-handed* with stock retracted: ST 8, Rcl 3.

The MP7A1 has an accessory rail (p. 161) over the entire receiver top to mount optics; a 0.2-lb. reflex sight (+1 skill) is standard. Rails on the sides accept targeting aids. It can be fitted with a 0.8-lb. baffle suppressor (-3 to Hearing, -1 Bulk). An extended 40-round magazine is available (-1 Bulk, $28, 0.9 lb.). With AP ammo: Dmg 3d(2) pi-.

Mechanical Machine Guns

Several attempts to design rapid-fire guns are made at TL5. It isn't until the perfection of the metallic cartridge that the problems of obturation (sealing the breech against pressure loss) and extraction are solved to allow field reliability, however. Muscle-powered mechanical machine guns continue to see service at early TL6, until replaced by automatic machine guns.

The heyday of the hand-cranked machine gun was during the late-19th-century colonial conflicts. Such weapons gave small forces an edge when battling superior numbers, and while generally mounted on horse carriages, were still lighter than contemporary artillery. Most armies considered them ill-suited for regular warfare, though. The world's navies more readily embraced the guns and used them in great numbers – they were ideal against the threat of relatively small and fast torpedo boats, and useful for supporting disembarking naval infantry.

Mechanical machine guns require skilled crews. If operation isn't smooth and even, these weapons can jam in a variety of unpleasant ways. The unfamiliarity penalty (see *Familiarity,* p. B169) for a mechanical machine gun is -5. Rolls to fix malfunctions (p. B407) are at a further -1 for those without experience with that particular model of gun. All such weapons are fired at -8 off their mount, which provides the necessary resistance to the torque of the rotating machinery.

Gatling M1874, .45-70 Springfield (USA, 1874-1877)

In 1862, Dr. Richard Gatling patented a gun that consisted of a cluster of barrels rotated by a crank on the right-hand side of the breech and fed by a gravity hopper (much like a coffee mill). Each turn of the crank fed, fired, and extracted a round. About 1,200 "Gatling guns" of various designs were produced in the U.S. The American military acquired some 725 of these; the rest were either bought by citizens and police departments or exported. Hundreds more were license-made in Austria, Britain, and Russia, and copied in China.

The 10-barreled M1874 was *the* classic Gatling used by the U.S. Army, which acquired 82. It was mounted on a two-wheeled artillery carriage (560 lbs. with gun) and came with a separate two-wheeled limber (840 lbs.) holding 2,000 rounds in 50 magazines. Carriage and limber (which add $6,500 to the gun's cost) were linked together and drawn by four horses. A 40-lb. tripod was offered ($1,800) but seldom bought, despite allowing a single pack animal to carry both mount and gun.

The M1874 fed from a detachable 40-round hopper magazine (8 lbs.). It could also use the 400-round Broadwell drum ($500, 60 lbs.). This was a circular cluster of 20 vertical, 20-round hoppers; after firing 20 rounds, the gunner had to rotate the drum manually to align the next cell with the feeder. (Rotating the drum takes two Ready maneuvers – or one, if an assistant does it. Installing a new drum takes 10 seconds.)

The original, six-barreled *M1862* (1862-1866) fired the .58 Berdan rimfire cartridge: Malf. 14, Dmg 5d pi+, Acc 3, Range 230/2,300, EWt. 390/7, RoF 3, Shots 50(3i). It was mounted on a two-wheeled wooden artillery carriage (450 lbs. with gun) and, with a 580-lb. limber holding 2,000 rounds, pulled by four horses. Very few were built; General Butler of the Union Army bought 12 and used them during the American Civil War. The *New York Times* acquired three, which were manned by staff during the New York riots in June 1863.

The six-barreled M1866 (1866-1871), in .50-70 Government, was the original-series production model: Malf. 15, Dmg 5d+1 pi+, Range 490/3,100, EWt. 224/3, RoF 10, Shots 22(5). The first 50 entered U.S. Army service in 1867; 22 more went to the Navy. It was mounted on a two-wheeled artillery carriage (426 lbs. with gun) and, with a 470-lb. limber, drawn by four horses.

At least 68 *M1866* guns were made in the much larger 1" caliber (1866-1871): Malf. 15, Dmg 7d+1 pi++, Acc 5, Range 420/2,700, EWt. 1,008/18, RoF 5, Shots 20(5), Cost $30,000/$60. These often fired canister: Dmg 2d-1 pi+, Acc 3, Range 60/1,100, RoF 5×15, Rcl 1.

The five-barreled *M1877 Bulldog* (1877-1883), in .45-70, was the smallest variant: Dmg 4d pi+, EWt. 90, RoF 7, ST 22M, Bulk -8, Cost $14,000. It was mounted on a 40-lb. tripod ($1,800). Intended for police service, it wasn't very successful. Adventurers could surely find a niche for it, though . . .

The 10-barreled *M1883* (1883-1889), in .45-70, had its barrels encased in a bronze shroud, protecting them and making them look like one fat barrel: Malf. 14, EWt. 237/24.5, Shots 104(5). It introduced the 104-round Accles Positive Feed drum ($650, 24.5 lbs.), a donut-shaped device driven by the gun. This drum didn't rely on gravity, allowing it to feed from the side instead of the top if required, thereby lowering the gun's silhouette and allowing installation in places with low ceilings, such as bunkers (or steam-powered mecha or ether flyers . . .). Unfortunately, the drum's feeding was less than "positive" and led to more jams. The M1883's crank had two positions; installing it at the rear raised RoF to 25 but worsened Malf. to 13. Forty were made and mounted on two-wheeled artillery carriages (831 lbs. with gun), pulled with a 754-lb. limber (holding four drums and 6,040 spare rounds) by four horses.

The 10-barreled *M1903* (1907-1911) was the final version, chambered for the .30-06 cartridge: Dmg 7d+1 pi, EWt. 200/4.

From 1868, the Russian army acquired at least 520 guns similar to the M1874 but chambered in 10.75×58mmR Berdan (Dmg 5d-1 pi+). Known in Russia as the Gorlov, after the Russian military attaché who inspected it, it was still in use against the Japanese in 1904. Argentina, Chile, Cuba, Guatemala, and Mexico used similar Gatlings in 11.15×58mmR Spanish Remington (Dmg 5d pi+), while Egypt bought it in 11.4×50mmR Egyptian Remington (Dmg 5d pi+).

The British Army's 10-barreled *Gatling Mk I* (1874) was chambered in .450 Gardner-Gatling: Dmg 5d pi+, EWt. 200/70, RoF 13, Shots 352(5), Bulk -9. Its 352-round Broadwell drum had 16 vertical cells, each holding 22 rounds. A lighter, 240-round drum (50 lbs.) held 16×15 rounds. The gun was mounted on a two-wheeled artillery carriage (444 lbs. with gun) and, with a 387-lb. empty limber, drawn by four horses.

Mechanical Machine Guns Table

See pp. B268-271 for an explanation of the statistics. Empty Weight (EWt.) and Cost assume neither ammo nor mount, but ammo weight follows the slash as usual.

GUNNER (MACHINE GUN) (DX-4 or other Gunner at -4)

TL	Weapon	Damage	Acc	Range	EWt.	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
5	Gatling M1874, .45-70	4d+1 pi+	4	470/3,000	200/8	15	40(5)	26M	-10	2	$16,000/$40	2	[1]
5	Hotchkiss 1-pdr, 37×94mmR	5d×2(0.5) pi++	4	570/3,600	495/18	2	10(5)	33M	-12	2	$20,000	1	[2]
	follow-up	2d [2d] cr ex											
5	Nordenfelt Single-Barrel, .450 MH	5d pi+	4	500/3,200	13/9	3	30(5)	15M	-6	2	$2,000/$45	2	[2]

Notes:

[1] Very Unreliable. Malfunctions on 15+ (see p. B407).

[2] Unreliable. Malfunctions on 16+ (see p. B407).

Hotchkiss 1-pounder, 37×94mmR Hotchkiss (France, 1875-1896)

The Hotchkiss rotary cannon, while externally similar to the Gatling, was bigger and differed internally. It had five rotating barrels, and fired a 1-lb. black-powder shell. Initially a naval weapon, it was intended as a defense against torpedo boats; contemporary torpedoes had a range of 400 yards, while the guns typically opened fire at 1,000 yards. It was exported to more than 30 countries and license-made in Britain, Germany, Russia, and the U.S. The Hotchkiss was uncommon on ground mounts, but the U.S. Army used it in the Indian Wars – for instance, against Sitting Bull's Sioux in 1879.

The Hotchkiss fed from a 10-round gravity hopper. A loader could top up the hopper with 10-round charger clips (18 lbs.) or loose rounds (1.4 lbs.) while the gun was firing. Aside from LE (in table), it fired solid (Dmg 5d×2 pi++), canister (Dmg 1d+1 pi++, Acc 3, Range 60/1,200, RoF 1×75, Rcl 1), and APEX (Dmg 4d×2(2) pi++ with a 1d+2 [2d-1] cr ex follow-up) – the last available from 1892. Land-service guns mounted on a two-wheeled artillery carriage (1,600 lbs. with gun) with a DR 15 gun shield.

Nordenfelt Single-Barrel, .450 Martini-Henry (U.K., 1882-1888)

The Swedish-designed Nordenfelt was a mechanical machine gun operated by working a lever on the right-hand side back-and-forth. Most models were heavy, carriage- or ship-mounted weapons with three to 12 barrels. However, Nordenfelt also offered a single-barreled version. Less than 10 were purchased for trials with the Royal Marines, who didn't adopt it. Nevertheless, it would make a marvelous portable machine gun, providing mobile firepower to a small group of soldiers or adventurers.

The Nordenfelt fed from two detachable hopper magazines – a 4.3-lb. one stacked atop a 4.7-lb. one – each holding 15 rounds. The shooter could fire all 30 rounds and then replace both magazines at once, or he could replace only the upper hopper after firing the first 15 rounds. The latter method was preferred, since users typically carried only one lower hopper but several (lighter) upper hoppers to keep weight down. The gun also featured a wire shoulder stock. It mounted on a 17-lb. folding tripod ($2,100). Alternate rifle calibers were available.

Machine Guns and Autocannon

Two TL6 developments – automatic actions and smokeless propellant – make true machine guns (MGs) practical. The MG quickly becomes the most important infantry support weapon, and several sub-variants evolve:

The *light machine gun (LMG)* fires rifle-caliber rounds, is generally air-cooled, and uses a bipod and a shoulder stock in lieu of a mount. These features make it light enough for a single gunner to carry and use. The LMG is a TL6 innovation intended to provide a lightweight, mobile automatic weapon for cavalry and for assaults on entrenched enemies. Use Guns (LMG).

The *medium machine gun (MMG)* also fires rifle-caliber rounds, but is mounted on a carriage, tripod, or vehicle. It's sturdily built to allow sustained fire for long periods. At TL6, MMGs are often water-cooled; at TL7, they're air-cooled. These weapons require a three-man team for transport. Once in position, one man acts as gunner, the second as loader, and the third as spotter. Use Gunner (Machine Gun).

The *general-purpose machine gun (GPMG)* is a late-TL6 hybrid combining the best features of the LMG and the MMG. Air-cooled and relatively light, one man can carry and operate it. However, it can be tripod-mounted for long-range engagements, and features a quick-change barrel for sustained fire. Use Guns (LMG) to fire handheld or from a bipod, or Gunner (Machine Gun) to shoot from a tripod or a vehicle mount.

The *heavy machine gun (HMG)* is similar to the MMG, but fires large-caliber rounds for increased range and punch. It's a mid-TL6 development, designed to penetrate the armor of early tanks and to shoot down aircraft. While sometimes tripod-mounted, most HMGs are installed on vehicles. Use Gunner (Machine Gun).

The *autocannon,* appearing at mid-TL6, is a large automatic weapon designed to fire high-explosive and armor-piercing rounds. The line between HMGs and autocannon is customarily drawn at 20mm. Use Gunner (Machine Gun).

Machine guns installed on vehicles are either "fixed" (on a fixed mount or in a turret) or "flexible" (on an external open mount); see *Vehicle Weapon Mounts* (p. B467). Fixed MGs synchronized to fire *through* a propeller have a lower RoF.

Some machine guns feed from box, drum, or hopper magazines, but most use ammunition belts, allowing longer periods of fire between reloads. Early MG belts are made of cloth, which absorbs mud and water, and which may even *rot* under arduous conditions. This decreases reliability; the GM may reduce Malf. by 1. At mid-TL6, disintegrating metal-link belts appear for aircraft weapons. Metal-link belts – disintegrating or non-disintegrating – are both lighter and less susceptible to water, and soon become standard for all MGs.

Changing a hot barrel typically requires 10 seconds and a Guns or Gunner skill roll. Critical failure means a burned hand. Treat this as 1d minutes of moderate pain (p. B428).

Maxim Mk I, .450 Martini-Henry (U.K., 1889-1897)

Invented by Hiram Maxim in 1883, this MMG was the first truly automatic firearm. It introduced the self-loading action and made popular the ammunition belt. It was water-cooled (7.5 pints) to allow sustained fire. In 1889, the British Army adopted it and Armstrong mass-produced it as the Maxim Mk I, in both .450 Martini-Henry (in table) and the new, smokeless .303 British: Dmg 6d+2 pi, Range 790/3,300, EWt. 40/16.

Water-Cooled Machine Guns

Many TL6 machine guns – and some TL6-8 autocannon – have barrels sheathed in water-filled cooling jackets. The water turns to steam as it cools the barrel. Typically, every 500 rounds fired consumes a pint of water. If firing continues after the water is gone, the barrel will start to deteriorate; see *Sustained Fire* (pp. 85-86).

Some mid-TL6 MGs have a condenser canister connected to the jacket by a flexible steam hose. Steam condenses to liquid water in the canister, allowing reuse. This multiplies the number of rounds per pint by 10.

In the absence of water, the gun crew needs to use *some* liquid to cool the gun. During WWII, Finnish and Russian MGs had "snow caps" that let the crew fill the jacket with snow instead of water. In North Africa, motor oil was used as a coolant. A common solution everywhere was to urinate into the cooling jacket!

Firing a couple belts will quickly bring the water to a boil. This was used as a handy way to get a fresh brew of tea or coffee in both World Wars . . . assuming clean water was used, of course.

Both Mk I variants used 250-round non-disintegrating belts (30 lbs., or 40 lbs. in wooden box, in .450). In 1893, a 150-round belt was introduced for the .450 model (18 lbs., or 23 lbs. in wooden box). Maxims were originally mounted on a horse-drawn, two-wheeled artillery carriage (1,456 lbs. including gun and limber). In 1897, a sturdy, 48-lb. tripod ($2,700) became available, allowing a single pack animal to carry mount and gun.

In 1885-1889, a few selective-fire pre-production guns were made, chambered in .450 Martini-Henry: Dmg 5d pi+, EWt. 60/40, RoF 10, Shots 333(5). The slim water jacket held 3 pints and the tripod ($2,850) weighed 14 lbs. In 1888, British explorer Henry Stanley was the first to commit such a gun to combat, during his rescue expedition in Darkest Africa.

Brazil bought the improved version in 7×57mm Mauser (Dmg 6d+2 pi); Belgium and Peru, in 7.65×53mm Mauser (Dmg 6d+2 pi); and Chile, in 7.92×57mm Mauser (Dmg 7d+1 pi). The U.S. Army acquired a few hundred in .30-06 (Dmg 7d+1 pi) as the M1904.

The TOZ *PM-1910* (1910-1943) was a Russian-made variant in 7.62×54mmR Mosin-Nagant: Dmg 7d pi, EWt. 44.7/22.7. These were widely used during WWI and WWII. The PM-1910 was usually mounted on a small, two-wheeled carriage (79 lbs.), which could be fitted with a DR 20 gun shield (20 lbs.).

Maxim 1-pdr Q.F. Mk I, 37×94mmR Hotchkiss (U.K., 1889-1916)

The water-cooled Maxim 1-pounder Quick-Fire Gun Mk I was the earliest autocannon – a Maxim MG scaled up to fire the 1-lb. Hotchkiss black-powder shell. It was originally intended for use against torpedo boats; the navies of Argentina, Spain, Turkey, the U.K., the U.S., and about 25 other nations adopted it. Germany and Russia made it under license. During the Anglo-Boer War in South Africa, both sides used it, and it was nicknamed the "Pom-Pom" due to its firing sound. German navy guns saw land service during the Boxer Rebellion in China, while the British used it as an anti-balloon gun on armored cars during WWI.

The Maxim 1-pounder used 25-round non-disintegrating belts (55 lbs., or 65 lbs. in wooden box). Land-service guns mounted on a two-wheeled carriage (765 lbs. with gun).

Colt Model 1895, 6×60mmR Lee (USA, 1897-1898)

The air-cooled Colt Model 1895 was the first truly American MG. Designed by John Browning, this MMG was popularly known as the "Potato Digger" due to the gas lever that swung in a vertical plane below the gun. The U.S. Navy adopted it as the MK I for the Marines, who used it in the Spanish-American War and in China during the Boxer Rebellion. The Model 1895 fed from a 120-round non-disintegrating cloth belt (7.4 lbs., or 20 lbs. for two belts in wooden box) and mounted on a 57-lb. tripod ($2,550) or a 146-lb. two-wheeled landing carriage.

The Model 1895 was produced in many calibers. Italy acquired it in 6.5×52mm Mannlicher-Carcano (Dmg 6d pi); Mexico, in 7×57mm Mauser (Dmg 6d+2 pi); Persia and Russia, in 7.62×54mmR Mosin-Nagant (Dmg 7d pi); Belgium, in 7.65×53mm Mauser (Dmg 6d+2 pi); and Australia, Canada, and South Africa, in .303 British (Dmg 6d+2 pi). Teddy Roosevelt's "Rough Riders" employed two privately acquired 7×57mm guns during the Spanish-American War.

The *MK I MOD 1* (1898-1902) was re-chambered in .30-40 Krag (Dmg 6d pi).

The *M1914* (1914-1917), adopted by the U.S. Army, was an improved model in .30-06: Dmg 7d+1 pi, EWt. 36/15.3, RoF 10!, Shots 250. It mounted on a 53-lb. tripod ($2,550). The NYPD also got a few but, like the Army, hardly used it.

The Marlin *M1917* (1917-1918), in .30-06, replaced the gas lever with a conventional piston, allowing installation in aircraft (p. 233): Dmg 7d+1 pi, EWt. 22.2, RoF 14! (RoF 10! if synchronized), Shots 500.

Madsen M/03, 8×58mmR Krag (Denmark, 1903-1924)

The Danish Madsen was the most widespread (though not the most *numerous*) LMG in the world during the first half of the 20th century, having been supplied to 34 nations despite its complexity and high price. The Danish army's first model was the *Maskingevær M/03* ("machine gun model 1903"). The M/03 took 30-round box magazines, inserted from the top. Export models sometimes used 24-, 25-, 40-, or 48-round magazines instead.

The Dutch East Indies bought the Madsen in 6.5×53mmR Mannlicher (Dmg 6d pi); Norway and Sweden, in 6.5×55mm Mauser (Dmg 6d pi); Brazil, Mexico, and Spain, in 7×57mm Mauser (Dmg 6d+2 pi); Russia, in 7.62×54mmR Mosin-Nagant (Dmg 7d pi); Argentina, Bolivia, and Paraguay, in 7.65×53mm Mauser (Dmg 6d+2 pi); Pakistan, in .303 British (Dmg 6d+2 pi); and Abyssinia, China, Germany, and Turkey, in 7.92×57mm Mauser (Dmg 7d pi). After WWII, Brazil, Denmark, Indonesia, and Thailand acquired it in .30-06 (Dmg 7d+1 pi). Production ceased in 1955. In less-developed parts of the world, national armies, guerrillas, political movements, and bandit gangs were all likely to have Madsens until the 1960s.

Maxim MG08, 7.92×57mm Mauser (Germany, 1908-1918)

In 1894, the German navy adopted a 7.92×57mm version of the Maxim (see *Maxim Mk I,* pp. 130-131) as the MG94. In 1908, the German army introduced a lighter model, which – together with its British and Russian equivalents – dominated the trench warfare of WWI, as seen in *All Quiet on the Western Front*. Some 32,000 were made.

The MG08 fed from a 250-round non-disintegrating cloth belt (16 lbs., or 19.5 lbs. in can). Its water jacket held 7 pints. The gun used an 88-lb. sled mount ($1,900; see *Pulling and Dragging,* p. B353) or a 71-lb. tripod ($2,850). It often included a 2-lb. 2.5× scope (+1 Acc). From 1915, APHC ammo (Dmg 7d+1(2) pi-) was available.

China, Persia, Poland, Turkey, and Yugoslavia also adopted the MG08. Brazil acquired it in 7×57mm Mauser (Dmg 6d+2 pi); Belgium, in 7.65×53mm Mauser (Dmg 6d+2 pi); and Bulgaria, in 8×50mmR Mannlicher (Dmg 6d+1 pi). Many an MG08 saw service during WWII; some even reappeared in Vietnam.

The *MG08/15* (1915-1918) was a lightened version with a shoulder stock and a bipod, intended for assault troops: Wt. 45.8/5.1, Shots 50(5), ST 13B†. The only widely used LMG with water cooling, its slim water jacket held 5 pints. It was a *heavy* LMG, barely serviceable by one man; Maxim gunners were picked for strength and endurance, and *still* had to take turns carrying the piece if they were to keep up with the riflemen. The MG08/15 fed from a 3.2-lb. 50-round belt coiled inside a drum (5.1 lbs. total) attached to the gun, but could also use the 250-round belt. About 130,000 were produced. The Germans kept this weapon in reserve use throughout WWII.

The air-cooled *LMG08/15* (1916-1918) – known to the Allies as the "Spandau," after the Berlin suburb where it was made – was Germany's standard fixed aircraft MG (p. 233) in WWI: EWt. 27.5, RoF 11! (RoF 7! if synchronized). The stream of air from the plane's motion provided sufficient cooling.

The air-cooled *LMG14 Parabellum* (1915-1918), developed from the Maxim, was a flexible MG for aircraft (p. 233) and Zeppelins: EWt. 23, RoF 11!, Bulk -7. It fed from a 100-round belt in a can or coiled on a spool. From 1917, it often had a 2-lb. 3× scope (+1 Acc).

Vickers Mk I, .303 British (U.K., 1912-1945)

The Vickers Mk I was a lighter, more reliable version of the Maxim Mk I (pp. 129-130), developed for the British Army. It saw extensive service in both World Wars and in many minor conflicts. It was often used for antiaircraft fire – a Vickers in the hands of the Australian Army was responsible for the death of Manfred von Richthofen, the "Red Baron." The Vickers was also made in Australia, India, and the U.S., and was widely supplied from Abyssinia and Iraq to New Zealand and Pakistan. The British finally retired it in 1968, but it was still in use in Africa and other places into the 1980s.

The Vickers used 250-round non-disintegrating belts (16 lbs., or 22 lbs. in wooden box). Its water jacket held 9 pints. The gun mounted on a 51-lb. tripod ($2,700). In 1942, the British Army introduced an extra-powerful (p. 165) .303 British cartridge, with a fully streamlined bullet, for MG use: Dmg 7d-1 pi, Range 1,100/4,500.

The gun was exported as the Vickers Class C. The Dutch East Indies adopted it in 6.5×53mmR Mannlicher (Dmg 6d pi); Argentina and Bolivia, in 7.65×53mm Mauser (Dmg 6d+2 pi); and Russia, in 7.62×54mmR Mosin-Nagant (Dmg 7d pi).

The Vickers was soon adapted for service on fighter aircraft (p. 233). The *Vickers Mk II* (1917-1927) was air-cooled and had a higher rate of fire: EWt. 22, RoF 14! (RoF 10! if synchronized). It was exported as the Vickers Class E. Brazil, Chile, and Venezuela acquired it in 7×57mm Mauser (Dmg 6d+2 pi); Argentina, Bolivia, and Peru, in 7.65×53mm Mauser (Dmg 6d+2 pi); Turkey, in 7.92×57mm Mauser (Dmg 7d pi); and Denmark, in 8×58mmR Krag (Dmg 7d pi). Japan copied it in .303 British.

Lewis Mk I, .303 British (U.K., 1914-1925)

Designed by American Isaac Lewis and revealed in 1911, this MG was light enough for one man to carry and operate. It had a distinctive silhouette, with an aluminum cooling jacket around the barrel and a flat, 47-round pan-drum above the receiver. The first guns were made in Belgium, but the British soon adopted the weapon as the Lewis Mk I. It was widely used until the 1930s. In WWII, it was common as a light antiaircraft gun on merchant ships and small naval vessels, and issued to second-line units and the British Home Guard.

The Lewis was the first MG to be fired from an airplane; a prototype saw air service in 1912. A dedicated aircraft version, the *Lewis Mk II* (1915-1930), lacked the barrel jacket and shoulder stock: EWt. 18.5. From 1916, it was used with a 97-round drum (8.9 lbs.). The weapon was employed as a flexible observer's gun (pp. 233, 235). T.E. Lawrence – and Ardeth Bay, in *The Mummy* – even fired it as a handheld weapon: ST 13†, Bulk -6, Rcl 3.

The Savage-Lewis *M1918* (1918) was a U.S.-made aircraft version (p. 233) in .30-06: Dmg 7d+1 pi, EWt. 22.9.

The unrelated but operationally similar Vickers *G.O. Mk I* (1937-1942), also known as the Vickers Class K, replaced the Lewis in RAF service: EWt. 20.5, RoF 16!, Shots 96(5). It was used as a manually aimed flexible MG on aircraft and ground vehicles (p. 237).

Hotchkiss Mle 1914, 8×50mmR Lebel (France, 1914-1930)

In 1897, Hotchkiss introduced an air-cooled MMG with distinctive, disc-shaped cooling fins around its massive barrel. This weapon evolved into the *Mitrailleuse Modèle 1914* ("machine gun model 1914") and remained the standard French MMG until early in WWII. In WWI, the U.S. Army used it, too; American soldiers nicknamed it and all its variants the "Woodpecker." The Mle 1914 was exported to Brazil and Spain in 7×57mm Mauser (Dmg 6d+2 pi), and to China, Greece, and Poland in 7.92×57mm Mauser (Dmg 7d+1 pi).

The Hotchkiss Mle 1914 used 24-round metal strips inserted from the side (1.5 lbs., or 26.4 lbs. for 12 strips in can) – or alternatively, 30-round strips (1.9 lbs., or 15 lbs. for six strips in can). The strips connected to make crude belts, if required. A spare barrel weighed 23.3 lbs. (treat as extra-heavy; see *Sustained Fire,* pp. 85-86). The Mle 1914 mounted on a tall, 53-lb. tripod ($2,850), usually equipped with a metal seat for the gunner.

The original *Mitrailleuse Modèle 1897* (1897-1900) saw use only in limited numbers, mainly by the Foreign Legion: EWt. 56, RoF 10!. It had a 36.5-lb. tripod. However, the Mle 1897 was exported in 7×57mm Mauser (Dmg 6d+2 pi) to Chile, Mexico, and Spain. Japan built it under license in 6.5×50mmSR Arisaka (Dmg 6d pi).

Developed from the Mle 1897, the Koishikawa *92 Shiki Juukikanjuu* (1932-1945), or "machine gun type 92," was the standard MMG of the Japanese army in WWII. It was chambered in 7.7×58mmSR Arisaka: Dmg 6d+2 pi, Range 1,100/4,600, EWt. 60.7/2, RoF 7!, Shots 30(5). Its 61.5-lb. tripod had sockets for carrying poles, allowing a three-man team to move the assembled weapon. It usually sported a 4× scope (+2 Acc).

Browning M1917, .30-06 Springfield (USA, 1917-1918)

This water-cooled MMG was the first in a long line of recoil-operated Browning machine guns. The U.S. military used the M1917 mainly as a battalion MG in infantry units. Some 43,000 were made.

The M1917 fed from 250-round non-disintegrating belts (15.3 lbs., or 20.3 lbs. in wooden box). Its water jacket held 8 pints. The gun mounted on a 61-lb. tripod ($2,700).

Between the World Wars, the design was exported as the Colt *MG38* (1924-1943). Brazil acquired this in 7×57mm Mauser (Dmg 6d+2 pi), while Argentina, Bolivia, Paraguay, and Peru adopted it in 7.65×53mm Mauser (Dmg 6d+2 pi). It was also made under license in Sweden, in 6.5×55mm Mauser (Dmg 6d pi) and 8×63mm Bofors (Dmg 7d+1 pi), and in Norway, in 7.92×57mm Mauser (Dmg 7d pi). China and Poland copied it in 7.92×57mm Mauser.

The WWII variant was the *M1917A1* (1936-1945): EWt. 40.6. It mounted on a 53-lb. tripod.

ZB ZB26, 7.92×57mm Mauser (Czechoslovakia, 1927-1941)

The ZB26 was one of the most successful LMGs ever. It was developed by the arsenal at Brno, adopted by Czechoslovakia's military, and exported in large numbers. Customers included China, Persia, and Yugoslavia. Brazil bought it in 7×57mm Mauser (Dmg 6d+2 pi). Some 150,000 were made.

The ZB26 was a conventional air-cooled LMG, fired from a bipod. It used 20-round detachable box magazines, inserted from the top. A spare barrel weighed 5.5 lbs.

The slightly improved *ZB30* (1930-1941) was even more popular: Wt. 23/1.8. During WWII, German troops – especially the *Waffen-SS* – used captured ZB30s. Romania built the weapon under license. Bolivia bought it in 7.65×53mm Mauser (Dmg 6d+2 pi) and Bulgaria acquired it in 8×50mmR Mannlicher (Dmg 6d+1 pi).

ZiD DP, 7.62×54mmR Mosin-Nagant (Russia, 1928-1946)

The *Ruchnoi Pulemet Degtyareva Pekhotnyi* ("Degtyarev's handheld infantry machine gun") was a simple LMG with an excellent reputation for reliability and ease of maintenance. The flat, pan-drum magazine on top of the receiver earned it the nickname "Russian guitar." The DP replaced the Madsen (p. 130) in front-line service with the Soviet army, who used it from the late 1920s to the 1950s. It was widely exported, equipping the Loyalists in the Spanish Civil War and the Viet Cong during the 1960s. It was also made in China.

The air-cooled DP included a bipod. It took flat, 47-round pan-drum magazines. A spare barrel weighed 4.4 lbs.

The *DT* (1929-1946) was a tank variant installed in many Soviet vehicles. It featured a retractable stock, a heavier barrel, and a 63-round drum: EWt. 23.1. It accepted a bipod to allow use away from the vehicle: Wt. 30/5, Shots 63(5), Bulk -7*. Many were issued to infantry and partisans in place of the DP (but magazines for the DT and DP *aren't* interchangeable).

The *DA* (1929-1936) was an aircraft model that also used the 63-round drum: EWt. 18.5. It served as a flexible gun in 1930s Soviet aircraft (p. 235).

Oerlikon Typ S, 20×110mmRB Oerlikon (Switzerland, 1931-1938)

The Oerlikon Typ S was sold worldwide as an antiaircraft autocannon, typically mounted on a two-wheeled carriage (570 lbs. with gun) that converted to a tripod in firing position. It fed from 60-round drums (62 lbs.) or 15-round box magazines (16 lbs.). It fired SAPHE-T (in table) and API-T (Dmg 6d×2(2) pi++ inc).

The *Typ SS* (1938-1947) was an improved variant: EWt. 147, RoF 8!. It was even more widespread, mounted on tripods or vehicles (especially ships). The U.K. and U.S. made hundreds of thousands.

Browning M1919A4, .30-06 Springfield (USA, 1934-1953)

This gun used the Browning M1917 (p. 131) action, but had a shorter barrel and no water jacket. While the M1919A4 was developed from a tank MG and installed in a number of tanks (p. 239), it was light enough for fast-moving troops to transport easily. It became the standard American *infantry* MMG in the 1930s. After WWII, surplus U.S. weapons were widely exported and saw continued service with some militaries for the rest of the 20th century. More than half a million were made, many in Canada. The U.S. Navy and the Canadian, Israeli, and South African armies, among other forces, eventually converted it to 7.62×51mm NATO (Dmg 7d pi).

The M1919A4 used 250-round non-disintegrating belts (15.3 lbs., or 18.8 lbs. in can). A spare barrel weighed 7.4 lbs. (treat as extra-heavy; see *Sustained Fire,* pp. 85-86); changing it required an asbestos glove. The weapon usually fired AP-T ammo (Dmg 5d(2) pi- inc). It mounted on a 14-lb. tripod ($2,550).

The original *M1919* (1919-1920) was installed in early tanks (p. 234): Dmg 7d-1, EWt. 33.

The Colt *MG32* (1932-1943) was the pre-war export version of the M1919A4 (use the same stats).

The *M1919A6* (1943-1954) was a desperate attempt to turn the M1919A4 into a LMG by adding a bipod, a shoulder stock, and a carrying handle: Wt. 47.8/15.3, Bulk -8, ST 13B†. It had a normal – *not* extra-heavy – barrel. Despite being too heavy and unwieldy for its intended role, the M1919A6 saw intense service in WWII and Korea.

The .30-caliber *M2* (1931-1945) was the last and most successful of several aircraft versions made since 1918, lightened and with a higher rate of fire: EWt. 21.5, RoF 20! (RoF 12! if synchronized). It was installed in many early USAF aircraft. Some 193,000 were made.

The Colt *MG40* (1932-1943) export version of the M2 was available in several calibers, 7.92×57mm Mauser being the most popular: Dmg 7d pi, EWt. 21.5, RoF 20!. The RAF adopted it in .303 British as the *Browning Mk II* (1938-1945), which was standard aircraft armament in early WWII: Dmg 6d+2 pi, EWt. 25.3, RoF 19! (RoF 12! if synchronized).

Rheinmetall MG34, 7.92×57mm Mauser (Germany, 1936-1945)

The *Maschinengewehr 34* was the first GPMG, intended to supply – in one gun – a LMG for infantry squads, a tripod-mounted support weapon at platoon level, an anti-aircraft gun for vehicles (including ships and submarines), a hull and coaxial gun for armored vehicles (pp. 235, 237-238), and a fortress gun. It lacked a heavy water jacket, instead being issued with two spare barrels – carried by the assistant gunner – that could be changed quickly (six seconds) to avoid burning one up in sustained fire. Germany, Hungary, and Romania used the MG34 during WWII. After

1945, it saw service with the French, Israelis, Biafrans, and Viet Cong, among others. Some 400,000 were made.

The MG34 fed from 50-round non-disintegrating belts (3 lbs., or 5 lbs. in assault drum), which could be connected to form longer belts (23.5 lbs. for 300 rounds in can). Weapons installed in tanks used 150-round belts in canvas bags. After exchanging the receiver cover (six seconds), the MG34 could take 75-round twin-drum saddle magazines (9.5 lbs., rare after 1940) *instead* of belts. Its trigger was pivoted in the middle; a pull on the top gave semi-auto while a pull on the bottom gave full-auto (see *Automatic Weapons,* pp. 82-83). It typically fired APHC-T ammo (Dmg 7d+1(2) pi- inc). A spare barrel weighed 4.4 lbs. (a case holding two weighed 12.5 lbs.); changing it required an asbestos glove. The MG34 could be mounted on an elaborate 46-lb. tripod ($2,600) with an integral 4× scope (+2 Acc).

The *MG15* (1932-1942) used the same action. It was installed as a flexible gun in many German aircraft (pp. 235, 237): Dmg 7d+1 pi, EWt. 18, RoF 16!, Bulk -6. It fed from 75-round twin saddle drums (9.4 lbs.). The MG15 was also made in Japan.

In WWII, the *MG17* (1934-1942) was the standard German light aircraft MG in fixed installations: Dmg 7d+1 pi, EWt. 27.7, RoF 20! (RoF 16! if synchronized). It used disintegrating belts.

Enfield Bren Mk I, .303 British (U.K., 1938-1945)

In the 1930s, the British introduced a development of the ZB30 (pp. 85-86), chambered in .303 British. It was manufactured under license at Enfield from 1938; BREN is an acronym for "Brno and Enfield." Some 300,000 were made. The Bren was also produced in Australia, Canada, and India.

The Bren was the standard British LMG of WWII. It was mounted on vehicles, too – often atop tank turrets, for anti-aircraft fire. The crew could easily dismount these weapons in the event that they had to abandon the vehicle.

The Bren used 30-round box magazines, inserted from the top. A 100-round pan drum (12 lbs.) was issued for guns mounted on tank turrets. A spare barrel weighed 6.3 lbs. (treat as extra-heavy; see *Sustained Fire,* pp. 85-86). The British Army used the Bren mainly from its bipod, but a 30-lb. tripod ($1,800) was available for sustained fire.

The *L4A4* (1960-1961) was a Bren converted to 7.62×51mm NATO: Dmg 7d pi, Wt. 23.6/2.6. It accepted the 20-round magazine of the L1A1 rifle (see *FN FAL,* p. 115). Some 7,500 were made and used until the 1990s – including in the Falklands War and the 1991 Gulf War. It was also manufactured in India.

Browning M2HB, .50 Browning (USA, 1938-1946)

During WWI, John Browning started work on a HMG by scaling up his .30-caliber MGs (pp. 131-132) to .50-caliber, basing the cartridge on that of the Mauser Tank-Gewehr (p. 112). In 1933, the weapon was perfected as the M2, which could be set up to feed from either side. The main ground-service version was the M2HB of 1938, which received a longer, heavier barrel for sustained fire.

The M2HB is an exceedingly successful design. A standard antiaircraft and light antivehicular weapon for the U.S. military since its introduction, it can be found on a 44-lb. tripod ($3,500) and mounted on boats (pp. 241-242), tanks (p. 239), trucks (p. 239), HMMWVs (pp. 242-243), and even jeeps (p. 237). Half a million were made during WWII alone, and production resumed in 1979. The gun has been exported widely and license-made in Belgium, Japan, South Korea, Taiwan, and the U.K.

The M2HB originally used 105-round disintegrating belts (31.8 lbs., 36.2 lbs. in can, or 95.6 lbs. for two belts in can). After 1945, 100 rounds were linked (30.3 lbs., or 34.7 lbs. in can). In the 1990s, 225-round belts appeared (68.2 lbs., or 73.7 lbs in can). Solid ammo is available (in table), but the usual load is API-T (Dmg 5d×2(2) pi inc). APHEX-T (Dmg 7d×2(2) pi with a 1d-2 [1d-2] cr ex follow-up) has also seen use since the 1980s, and APDS-T (Dmg 6d×3(2) pi inc) since 1993.

A spare barrel weighs 27 lbs. (treat as extra-heavy; see *Sustained Fire,* pp. 85-86). From 1978, the M2HB often mounts a 7.5-lb. 6.5× night sight (+2 Acc and Night Vision 5, 2×XS/30 hrs.) – or, as of 1997, a 5.5-lb. 10× thermal sight (+3 Acc and Infravision, M/12 hrs.). Also in 1997, an 11-lb. computer sight (+2 Acc scope, +3 Acc laser rangefinder, Night Vision 7, +1 Gunner, p. 157) became available.

The .50-caliber *M2* (1933-1945) was an aircraft version that armed practically all U.S. combat aircraft during WWII: Dmg 6d×2 pi+, Range 1,700/7,100, EWt. 64, RoF 13!, Bulk -8. It was exported as the Colt MG53.

The FN-Browning *M3P* (1984-) is an upgraded Belgian variant for fixed installation in vehicles: Dmg 6d×2 pi+, Range 1,700/7,100, EWt. 80, RoF 18!, Bulk -8. The U.S. Army adopted it as the M296. The *M3M* (1984-) is the same weapon for manual firing as a door gun: EWt. 77. The USAF calls this the GAU-21/A.

KPZ DShK-38, 12.7×108mm (Russia, 1938-1946)

The *Degtyarev-Shpagin Pulemet Krupnokaliberni obrazets 1938g* ("Degtyarev and Shpagin's heavy-caliber machine gun model 1938") was in many ways the Soviet equivalent of the .50-caliber Browning (above). It used 50-round disintegrating belts (16.9 lbs., or 21 lbs. in can). Alternative ammo included API-T (Dmg 5d×2(2) pi inc), APHC-T (Dmg 7d×2(2) pi inc), and SAPHE-T (Dmg 7d×2 pi+ with a 1d [1d-2] cr ex follow-up). A spare barrel weighed 28 lbs. (treat as extra-heavy; see *Sustained Fire,* p. 85). The weapon's usual mount was a two-wheeled, 266-lb. carriage with a DR 25 gun shield, which could be set up for antiaircraft fire.

The *DShKM* (1946-1980) was a post-war variant that saw extremely wide service, including as a flexible gun on tanks: EWt. 78.5. It has been manufactured in Bulgaria, China, Czechoslovakia, Iran, Kazakhstan, Pakistan, Poland, and Romania. The Chinese have made APDS-T (Dmg 6d×3(2) pi inc) for it since the 1990s.

Mauser MG151/20, 20×82mm Mauser (Germany, 1941-1945)

The MG151/20 was installed in many Nazi combat aircraft (p. 237) and some Italian, Japanese, and Romanian fighters during WWII. Late in the war, antiaircraft mounts and fast attack boats also carried it. Some 36,000 were made. After the war, France and South Africa copied it, and those countries and Rhodesia used it as a door gun on light helicopters (p. 241).

The MG151/20 used disintegrating belts (60.3 lbs. for 125 rounds, or 110 lbs. for 200 rounds in wooden box). Besides SAPHE-T (in table), it fired AP-T (Dmg 5d×2(2) pi++ inc) and SAPHEC-SD (Dmg 7d×2 pi++ with a 3d cr ex follow-up, Range 1,200), the latter for air-to-air combat (RoF 10! if synchronized).

Rheinmetall MG42, 7.92×57mm Mauser (Germany, 1942-1945)

The MG34 (p. 132-133), while completely satisfactory in the field, was expensive and slow to produce. The MG42, designed to replace it, was simpler to make thanks to the extensive use of sheet-metal stampings. More than 350,000 were made. The MG42 was famous for its high rate of fire; its distinctive sound has been likened to that of tearing linen.

The MG42 used 50-round non-disintegrating belts (3 lbs., or 5 lbs. in assault drum), which could be linked to form longer belts (23.5 lbs. for 300 rounds in can). A spare barrel weighed 4 lbs. (a case holding two weighed 11.7 lbs.); it took only three seconds to change, but this required an asbestos glove. The weapon usually fired AP-T ammo (Dmg 5d-1(2) pi- inc). For sustained fire, it was mounted on a 46-lb. tripod ($2,600) with an integral 4× scope (+2 Acc).

After WWII, the MG42 was available in 7.62×51mm NATO as the *MG42/59* (1959-1968), called the MG1 in German service: Dmg 7d-1 pi, Wt. 27.6/3.3. It was licensed to Austria and Italy (these versions had RoF 13!), and to Pakistan.

The final iteration was the *MG3* (1968-1979), also in 7.62×51mm NATO: Wt. 27.6/3.3. This is still in service around the world and has been license-made in Greece, Iran, Pakistan, Spain, and Turkey. The MG3 can use both disintegrating and non-disintegrating belts; belt lengths include 50 (3.3 lbs., or 3.7 lbs. in assault drum), 120 (7.9 lbs., or 8.6 lbs. in assault can), and 250 rounds (16.5 lbs., or 20 lbs. in can).

ZiD KPV, 14.5×114mm (Russia, 1944-1955)

The *Krupnokaliberni Pulemet Vladimirova* ("Vladimirov's heavy-caliber machine gun") fired a 14.5×114mm cartridge originally developed for an antitank rifle in the 1930s. It was used primarily as an antiaircraft gun in single, twin, and quadruple towed mounts, and in single and twin mounts on naval vessels. Its weight made it an unlikely encounter on the infantry line – but any attack on a Soviet-era airfield or missile site would have faced a hail of 14.5mm fire. The KPV was also made in China and North Korea, and widely distributed.

The KPV used 40-round disintegrating belts (20.9 lbs., or 25 lbs. in can). It fired APHCI-T (in table) and SAPHE-T (Dmg 6d×3 pi+ with a 1d+1 [1d-1] cr ex follow-up). The smallest AA mount, the ZPU-1, was a manually traversed, two-wheeled carriage (960 lbs. with a single gun) with a gunner's seat. The ZPU-1 broke down into five loads for pack-animal transport, and was light enough to mount on pickup trucks (sometimes called "technicals").

The *KPVT* (1947-) is a variant for armored vehicles (p. 240): EWt. 115.

ZiD RPD, 7.62×39mm (Russia, 1948-1968)

In 1948, the Soviets adopted the *Ruchnoi Pulemet Degtyareva* ("Degtyarev's hand-held machine gun"), a bipod-mounted MG chambered for the intermediate-sized cartridge of the SKS-45 (p. 115) and AK-47 (p. 114) rifles. It used an action developed from that of the DP (p. 132), but fed from 100-round non-disintegrating belts (4.1 lbs., or 5.3 lbs. in drum). The result was a neat, light squad automatic weapon. The RPD was widely exported, and made under license in China, Egypt, Hungary, and North Korea. U.S. Army Special Forces sometimes used it in Vietnam.

Saco M60, 7.62×51mm NATO (USA, 1957-1983)

The U.S. military's standard GPMG for decades, the M60 was lighter than many competing designs but suffered from reliability issues. American gunners often called it "the Pig." They also despised its less-than-perfect barrel-changing arrangements: bipod, front sight, and gas system were permanently attached to the barrel, so the hot gun couldn't support itself without its barrel and the gunner's assistant had to lug an overly heavy spare. Few countries chose the M60 over other MGs, but it was widely supplied to U.S. allies, especially in Central America and Southeast Asia. It was licensed to Taiwan.

The M60 used 100-round disintegrating belts (6.6 lbs., 7 lbs. in nylon carrier, or 18.7 lbs. for two belts in can). A spare barrel weighed 8.2 lbs.; changing it required an asbestos glove. A 15-lb. tripod ($1,800) let the weapon function in the MMG role. Starting in 1978, the M60 was often fitted with a 3.3-lb. 4× night sight (+2 Acc and Night Vision 5, 2×XS/30 hrs.).

The *M60C* (1962-1983) was a remote-fired variant for installation on helicopter gunships and light attack aircraft (p. 243): EWt. 24.

The *M60D* (1962-1983) had spade grips at the rear for use as a helicopter door gun or as an antiaircraft gun on tank turrets: EWt. 24.3. It retained the bipod for emergency use off the vehicle.

The *M60E3* (1983-) is an improved version: Wt. 26.3, Cost $10,500. New features include a pistol foregrip, light barrel (see *Sustained Fire,* pp. 85-56), better barrel-change arrangements, a lighter bipod, and feed improvements. A shorter barrel is available for assault: Dmg 7d-1 pi, Range 900/3,750, Wt. 26, Bulk -6. The U.S. Marine Corps and Navy SEALs adopted it in 1985 and used it until the 1990s.

FN MAG, 7.62×51mm NATO (Belgium, 1958-)

The *Mitrailleuse à Gaz* ("gas-operated machine gun") is FN's companion to the FAL rifle (p. 115). It's an extremely successful GPMG, standard issue in most countries that don't use the PK (p. 135), the M60 (see above), or an MG42 variant (see above). It has been made in Argentina, India, Israel, Singapore, Sweden, Taiwan, the U.K., and the U.S., and is liable to be found almost anywhere in the world.

The MAG uses 100-round disintegrating belts (6.6 lbs., or 18.7 lbs. for two belts in can), although some users specify non-disintegrating belts. A spare barrel weighs 6 lbs. The gun mounts on a 23-lb. tripod ($1,800).

The U.S. military originally adopted it as the *M240* coaxial gun (1977-) on armored fighting vehicles: EWt. 24.2.

The U.S. Marine Corps uses the *M240G* (1994-). This is identical to the basic MAG. It replaces the M60E3.

The U.S. Army acquired the modified *M240B* (1997-) to replace the M60. It has heat shields and accessory rails: EWt. 27.6. It mounts on a lightened 11.5-lb. tripod ($2,250). Since 1999, it often has a 5-lb. 5× thermal sight (+2 Acc and Infravision, M/12 hrs.) – or, from 2001, a 1.5-lb. 3.4× scope (+1 Acc and removes -1 from darkness penalties, XS/175 hrs.). In 2006, a 50-round belt (3.3 lbs.) in a 0.2-lb. soft pouch was introduced.

The *M240D* (1997-) has spade grips at the rear for use on tank turrets or as a helicopter door gun: EWt. 25.6.

KMZ PK, 7.62×54mmR Mosin-Nagant (Russia, 1961-1969)

The Soviet army adopted the *Pulemet Kalashnikova* ("Kalashnikov's machine gun") as its GPMG. This was yet another modification of the Kalashnikov (p. 114) action. The lightweight PK series was widely exported, and also made in Bulgaria, China, Hungary, Poland, Romania, and Yugoslavia.

The PK used non-disintegrating belts of 100 (5.4 lbs., or 8.6 lbs. in can) or 250 rounds (13.4 lbs., or 20.7 lbs. in can). A spare barrel weighed 4.8 lbs. The weapon was designated *PKS* when mounted on a 16.5-lb. tripod ($1,650).

The *PKT* (1962-1969) was a coaxial version, for armored vehicles (p. 240): EWt. 23.1.

The *PKM* (1969-) is a modernized version: Wt. 26/8.6. The *PKMS* is mounted on a new 9.9-lb. tripod ($2,500). The *PKMT* is a coaxial MG for armored vehicles (p. 244): EWt. 25.8. The PKM accepts a 2.9-lb. 5× night sight (+2 Acc and Night Vision 5, XS/10 hrs.).

MAC AA7.62NF1, 7.62×51mm NATO (France, 1963-1975)

The *Arme Automatique de 7.62N Modèle F1,* a GPMG with a retractable stock, is still standard with the French military. It has been widely exported, especially to Africa. The AA7.62NF1 uses 50-round disintegrating belts (3.3 lbs., or 18.7 lbs. for four belts in can). It can be mounted on a 23-lb. tripod ($1,650). Several sub-variants exist. The AFV version (p. 240) has an extra-heavy barrel (see *Sustained Fire,* pp. 85-86) and a remote trigger: EWt. 19.4.

The AA7.62NF1's predecessor was the *Arme Automatique Modèle 52* (1952-1963), in 7.5×54mm MAS: Dmg 7d pi, Wt. 26.5/3.2, RoF 11, Shots 50(5). It was used in the Algerian War and several other conflicts.

GE M61A1 Vulcan, 20×102mm (USA, 1964-)

After WWII, the USAF began searching for a new fast-firing aircraft gun based on the Gatling design (see *Gatling M1874,* p. 127). In 1956, it adopted the M61 Vulcan: an externally powered cannon with six rotating barrels, feeding from a disintegrating belt. The M61A1 soon superseded the M61; it employed a linkless feeder for better reliability and a higher rate of fire. It was license-made in Italy and Japan.

Like most modern aircraft cannon, the M61A1 has two selectable rates of fire: RoF 66! and RoF 100! (the original M61 fired at RoF 66! only). Some installations fire at other rates; e.g., USAF fixed-wing gunships such as the AC-130E and AC-130H Spectre mount the gun with a fixed RoF 41!. An externally powered drum magazine holds the linkless ammo. Capacity varies by application; most fighters carry 500-1,000 rounds. Besides SAPHE (in table), it fires API (Dmg 6d×2(2) pi++ inc) and APEX (Dmg 6d×2(2) pi++ with a 1d+2 [1d] cr ex follow-up). In 1988, a low-drag SAPHE round became available (Range 1,650/6,900). The M61A1's power requirement is 26 kW.

Used as a naval close-in weapon system (CIWS), the gun is known as the *MK 15 MOD 0 Phalanx.* It fires APDSDU (Dmg 7d×4(2) pi+ inc, Range 1,800/7,700) and has a fixed RoF 50!.

A minor variation called the *M168* (1968-1982) was installed on APC variants for air defense. It fired at RoF 16! and RoF 50!.

The *M197 Vulcan* (1969-) is lightened by using only three barrels: Wt. 146, RoF 12!/25!, ST 24M, Bulk -10. Its power requirement is 2.2 kW. Designed for helicopter gunships, it also arms the Gunhed mecha in the movie *Ganheddo.*

GE M134, 7.62×51mm NATO (USA, 1964-1973)

Essentially a miniaturized M61A1 Vulcan cannon (above), the M134 "minigun" is an externally powered, six-barreled rotary gun. It was originally developed to arm helicopters (p. 241) during the Vietnam War. U.S. Navy SEALs have used it on small raiding boats, while U.S. Army Special Forces mount it on "Humvees" (p. 242).

The M134 uses disintegrating belts – typically with several *thousand* rounds (204 lbs. for 3,000-round belt in can, or 322 lbs. for 4,500-round belt in can). It has two selectable rates of fire: RoF 33! and RoF 66!. Its power requirement is 2.2 kW, supplied by a vehicle generator or a separate 35-lb. battery pack (3×L/6,000 shots).

The USAF installed the almost identical *GAU-2B/A* (1964-1973) in helicopters, ground-attack aircraft, and fixed-wing gunships. It fired at RoF 50! and RoF 100!. Its power requirement was 3.6 kW.

Electric Gatling Gun

Electrically powered rotary cannon don't enter widespread use until TL7, but they're *invented* at early TL6!

Gatling M1893, .30-40 Krag (USA, 1893)

The first attempt to upgrade the manually powered Gatling design (see *Gatling M1874,* p. 127) was an 1890 experiment involving an external motor attached to an M1889 Gatling. Improvements soon followed – Dr. Gatling himself patented a 10-barreled, water-cooled gun with an electric motor *inside* its bronze housing. The M1893 Electric Gatling Gun's cyclic rate was a marvelous 3,000 shots per minute (RoF 50!), a feat that would remain unrivalled until the M61 Vulcan (see below) appeared in the 1950s. The weapon was designed for naval use, as a ship's generators could supply the necessary electrical power, but would suit an alternate-history airship or a steam-powered walker wonderfully. A single prototype was built. It fed from a 104-round Accles drum ($650, 21 lbs.) and required external power (1 kW).

The Dillon *M134DT* (2006-) is a lightened version using titanium components: EWt. 53.1, RoF 50!, Cost $25,000.

The M134 made a famous (if unrealistic) appearance as a man-pack weapon in the films *Predator* and *Terminator 2*. Such a contraption – custom-fitted with sling swivels and handles to hold it – would have EWt. 65, RoF 30!, ST 16†, Rcl 3, Cost $25,000. Including 12-lb. camera battery belt (5×M/2,000 shots) and cabling, 4-lb. ammo chute, 37-lb. ammo can (400 rounds), and 4-lb. backpack frame, total weight would be 122 lbs.

H&K HK21A1, 7.62×51mm NATO (Germany, 1970-1982)

In the 1960s, Heckler & Koch designed a family of LMGs based on components of their G3 rifle (p. 116). The most common variant was the HK21A1, which was also license-made in Greece and Mexico. The U.S. Army's Delta Force used the HK21A1 during Operation Eagle Claw in 1980.

The HK21A1 fed from a 100-round disintegrating belt (6.6 lbs., or 7.9 lbs. in assault can). With an $850 adapter, it could instead use the G3's 20-round magazine (1.7 lbs.) and 50-round drum (4.3 lbs.). A spare barrel weighed 3.7 lbs. (changing it takes only *three* seconds). A 22-lb. tripod ($1,650) was available. The HK21A1 accepted most G3 rifle accessories, including a 1.4-lb. 4× scope (+2 Acc).

The original version was the *HK21* (1961-1970): Wt. 25.3/7.9, RoF 15. This could only use belts, and reloading was slower (seven Ready maneuvers). It also had some reliability issues (Malf. 16). It was license-made in Portugal.

The *HK21E* (1982-) superseded the HK21A1. It has a longer barrel and allows three-round limited bursts: Dmg 7d pi, Wt. 27/6.6, RoF 9/13, Bulk -7.

The *HK23E* (1982-2004) is the same weapon in 5.56×45mm NATO: Dmg 5d-1 pi, Range 750/3,100, Wt. 26.8/7.5, RoF 9/13, Shots 200. With an $850 adapter, it can use M16 magazines: Wt. 20.3/1, Shots 30+1(3).

Molot NSV-12.7 Utes, 12.7×108mm (Russia, 1972-2001)

The NSV-12.7 *Utes* ("Cliff") superseded the DShKM (see *KPZ DShK-38,* p. 133) as the standard antiaircraft HMG on Soviet tank turrets (p. 244). Widely exported, it was also made in Bulgaria, India, Kazakhstan, Poland, Ukraine, and Yugoslavia.

The NSV-12.7 feeds from 50-round disintegrating belts (16.9 lbs., or 24.4 lbs. in can). A spare barrel weighs 19.8 lbs.

The weapon's designation changes to *NSVS-12.7* when mounted on a 35-lb. tripod ($2,850) for infantry use. In this configuration, a 3.7-lb. 3-6× variable scope (+2 Acc) is standard issue. The gun also accepts a 7-lb. 6.4× night sight (+2 Acc and Night Vision 5, 2×XS/25 hrs.).

Hughes M242 Bushmaster, 25×137mm Oerlikon (USA, 1981-)

This externally powered autocannon employs two internal chains to operate the action, whence the trademark name "Chain Gun." It's mounted on U.S. Army and Marine Corps armored vehicles. As the MK 38 MOD 0, it also arms various U.S. Navy and Coast Guard vessels. More than 11,000 have been made, and it's widely exported.

The M242 has a dual feeder, allowing the gunner to change from one ammo belt to another at the flick of a switch (a Ready maneuver). It uses disintegrating belts, which come in 15-round segments (19 lbs., or 47.7 lbs. for 30 rounds in can). In addition to SAPHE-SD-T (in table), it fires APDS-T (Dmg 6d×5(2) pi+ inc, Range 3,200/16,500), APFSDSDU-T (Dmg 6d×8(2) pi inc, Range 4,200/17,600), and, in Navy use, APDU-T (Dmg 6d×5(2) pi++ inc, Range 2,100/8,800).

FN MINIMI, 5.56×45mm NATO (Belgium, 1982-)

The *Mini-Mitrailleuse* ("mini-machine gun") is the most widespread LMG in use at the dawn of the 21st century. The MINIMI has been made in Australia, Canada, Greece, Italy, Japan, and the U.S. The U.S. military has used it as the M249 Squad Automatic Weapon (SAW) since 1984.

The MINIMI feeds from a 200-round disintegrating belt (6.4 lbs.) held in a 0.6-lb. plastic can (which rattles: -1 to Stealth). It can use M16 rifle magazines in an emergency, increasing RoF to 15! and reducing Malf. to 16. In 1990, a 100-round belt (3.2 lbs.) in a 0.2-lb. soft pouch was introduced. A spare barrel weighs 3.5 lbs. Since 2001, many M249s mount a 1.5-lb. battery-illuminated 3.4× scope (+1 Acc and removes -1 from darkness penalties, XS/175 hrs.).

The *MINIMI-Para* (1985-), for paratroops, has a shorter barrel and a retractable shoulder stock: Dmg 4d+2 pi, Acc 4, Range 700/2,900, Wt. 22.7/7, Bulk -6*, Cost $3,700.

The *MK 46 MOD 0* (2001-) is an improved variant with a shortened barrel, designed for the U.S. Navy SEALs: Dmg 4d+2 pi, Acc 4, Range 750/3,100, Wt. 16/3.4, Shots 100(5), Cost $4,500. To improve reliability, it lacks the magazine feeder – the MK 46 MOD 0 can only use belts. It has accessory rails (p. 161) on the receiver top and around the forearm, and a detachable 1-lb. bipod. It accepts a 1.7-lb. sound suppressor (-3 to Hearing, -1 Bulk).

The *MK 48 MOD 0* (2003-) is similar to the MK 46 MOD 0, but chambered in 7.62×51mm NATO: Dmg 6d+1 pi, Acc 5, Range 900/3,750, Wt. 25.3/6.8, Shots 100(5), Cost $8,000.

Machine Guns and Autocannon Table

See pp. B268-271 for an explanation of the statistics. For MMGs, HMGs, and autocannon, Empty Weight (EWt.) and Cost assume neither ammo nor mount (e.g., a tripod), but ammo weight follows the slash as usual; see the weapon description for details. For LMGs and GPMGs, Weight *includes* ammunition.

GUNNER (MACHINE GUN) (DX-4 or other Gunner at -4)

TL	Weapon	Damage	Acc	Range	EWt.	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
6	Maxim Mk I, .450 MH	5d+2 pi+	4	500/3,200	40/30	10	250(5)	12M	-7	2	$7,000	1	[1]
6	Maxim 1-pdr, 37×94mmR *follow-up*	5d×2(0.5) pi++ 2d [2d] cr ex	4	480/4,500	410/55	5	25(5)	31M	-11	2	$15,000	1	
6	Electric Gatling M1893, .30-40	6d+1 pi	5	1,000/4,200	300/21	50!	104(5)	29M	-10	2	$25,000	1	[1, 2]
6	Colt Model 1895, 6×60mmR	5d pi	6	700/3,000	35/7.4	8!	120(5)	17M	-7	2	$5,000	1	[1]
6	Maxim MG08, 7.92×57mm	7d+1 pi	6	1,000/4,400	59.4/16	8!	250(5)	19M	-8	2	$7,000	1	
6	Vickers Mk I, .303	6d+2 pi	6	800/3,300	40/16	10!	250(5)	18M	-7	2	$5,500	1	
6	Hotchkiss Mle 1914, 8×50mmR	7d pi	6	1,100/4,800	57.1/1.9	8!	30(5)	19M	-8	2	$5,000	1	
6	Browning M1917, .30-06	7d+1 pi	5	1,100/4,500	36.8/15.3	10!	250(5)	17M	-7	2	$5,200	1	
6	Oerlikon Typ S, 20×110mmRB *follow-up*	6d×3 pi++ 2d-1 [1d] cr ex	6	1,700/6,400	135/62	5	60(5)	26M	-10	3	$21,000/$410	1	
6	Browning M1919A4, .30-06	7d pi	5	1,100/4,500	30.9/15.3	10!	250(5)	17M	-6	2	$5,700	1	
6	Browning M2HB, .50 Browning	7d×2 pi+	5	1,800/7,600	84/35	8	100(5)	21M	-9	2	$15,000	1	
6	KPZ DShK-38, 12.7×108mm	7d×2 pi+	5	1,800/7,700	73.3/16.9	8!	50(5)	20M	-9	2	$12,000	1	
7	Mauser MG151/20, 20×82mm *follow-up*	7d×2 pi++ 2d [1d] cr ex	5	1,200/6,900	92.4/48.2	12!	100(5)	22M	-9	2	$14,700	1	
7	ZiD KPV, 14.5×114mm	8d×2(2) pi inc	6	2,100/8,800	108/20.9	10	40(5)	23M	-9	2	$18,000	1	
7	GE M61A1, 20×102mm *follow-up*	6d×3 pi++ 2d [1d] cr ex	5	1,250/5,300	251/Var.	66!/100!	Var.	29M	-11	2	$40,000	1	[2, 3]
7	GE M134, 7.62×51mm	7d pi	5	1,000/4,200	61/322	33!/66!	4,500(10)	20M	-7	2	$20,000	1	[2, 3]
7	Molot NSV-12.7, 12.7×108mm	7d×2 pi+	5+2	1,800/7,700	55/16.9	12!	50(5)	19M	-8	2	$14,000	1	
8	Hughes M242, 25×137mm *follow-up*	6d×4 pi++ 3d+2 [1d+1] cr ex	6+3	2,400/3,300	244/38	3	30(5)	28M	-11	2	$60,000	1	[2, 3]

GUNS (LMG) (DX-4 or most other Guns at -2)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
6	Madsen M/03, 8×58mmR	7d pi	5	1,000/4,200	25.4/2.9	7!	30(3)	11B†	-7	2	$4,500/$35	1	
6	Lewis Mk I, .303	6d+2 pi	5	800/3,300	32.8/4.5	9!	47(5)	12B†	-7	2	$3,000/$260	1	
6	ZB ZB26, 7.92×57mm	7d pi	5	1,100/4,400	21.2/1.8	8	20(3)	11B†	-7	2	$4,100/$31	1	
6	ZiD DP, 7.62×54mmR	7d pi	5	1,000/4,200	26.2/6.2	9	47(5)	11B†	-7	2	$3,000/$260	1	
6	Rheinmetall MG34, 7.92×57mm	7d pi	5	1,100/4,400	31.6/5	15	50(5)	12B†	-7	2	$4,200	1	
6	Enfield Bren Mk I, .303	6d+2 pi	5	800/3,300	25.6/2.8	8	30(3)	11B†	-7	2	$5,000/$33	1	
7	Rheinmetall MG42, 7.92×57mm	7d-1 pi	5	1,100/4,400	30.5/5	20!	50(5)	12B†	-7	2	$3,400	1	
7	ZiD RPD, 7.62×39mm	6d pi	5	600/3,900	16.3/5.3	11!	100(5)	10B†	-6	2	$1,500	1	
7	Saco M60, 7.62×51mm	7d pi	5	1,000/4,200	29.6/6.6	9!	100(5)	12B†	-7	2	$6,000	1	
7	FN MAG, 7.62×51mm	7d pi	5	1,000/4,200	30.5/6.6	12!	100(5)	12B†	-7	2	$6,900	1	
7	KMZ PK, 7.62×54mmR	7d+1 pi	5	1,100/4,800	28.4/8.6	11!	100(5)	11B†	-7	2	$2,500	1	
7	MAC AA7.62NF1, 7.62×51mm	7d pi	5	1,000/4,200	28.5/6.6	15!	100(5)	11B†	-7*	2	$6,000	1	
7	H&K HK21A1, 7.62×51mm	6d+2 pi	5	900/3,750	26.2/7.9	13	100(5)	11B†	-6	2	$5,800	1	
8	FN MINIMI, 5.56×45mm	5d pi	5	800/3,500	22.6/7	12!	200(5)	11B†	-6	2	$3,300	1	

Notes:

[1] Unreliable. Malfunctions on 16+ (see p. B407).

[2] Needs power source (see description).

[3] Very Reliable. Won't malfunction unless lack of maintenance lowers Malf. (see p. B407).

Cannon

"Cannon" are all guns that have a bore larger than 20mm and that are incapable of automatic fire – whether intended for direct fire, indirect fire, or both. They're normally mounted on artillery carriages or vehicles. This definition encompasses a wide variety of armaments. Examples described here range from whaling guns to tank guns (see Chapter 8 for the tanks themselves).

At TL5, cannon aren't significantly different from their TL3-4 predecessors, except for minor improvements in materials, construction, and ammunition. A gunner in Marlborough's army (early 1700s) would have been equally at home with Gustavus Adolphus at Breitenfeld (1631) or with Meade at Gettysburg (1863). Late in TL5, *rifled* artillery pieces enter service. In 1858, France became the first country to adopt rifled cannon.

> *With seventy gunners be'ind me, an' never a beggar forgets*
> *It's only the pick of the Army that handles the dear little pets – 'Tss! 'Tss!*
> *For you all love the screw-guns – the screw-guns they all love you!*
> *– Rudyard Kipling, "Screw-Guns"*

At TL6, many innovations emerge, among them smokeless propellant (p. 185), obturation, recuperation, breechloading, fire direction, and forward observation. *Obturation* is sealing the chamber against loss of gas upon firing; it allows a given charge of propellant to send the projectile much farther. *Recuperation* involves fitting hydraulic or mechanical devices to the gun to absorb recoil and keep it in position. *Breechloading* is loading from the rear, which increases reloading speed and offers mounting advantages. *Fire direction* and *forward observation* improve the utility of guns beyond line of sight.

At TL7-8, cannon are again little changed. The gradual improvements involve mountings (particularly self-propelled carriages and vehicles), ammunition, and targeting equipment.

Greener Harpoon Gun, 1.5" Caplock (U.K., 1837-1870)

This smoothbore, muzzleloading harpoon gun was probably the most common model used by 19th-century American and British whalers. It was typically pintle-mounted on whaling boats and yachts. It had twin caplocks (as a failsafe in case one didn't function in the harsh saltwater environment), protected by a hinged brass cover when not in use, and fired a 4.5'-long barbed harpoon attached to a 30-yard 1" rope.

Bourges Mle 1853, 12-pounder (France, 1853-1860)

The *Canon-Obusier de 12 livres Modèle 1853* ("12-pounder gun model 1853") was a smoothbore, muzzleloading bronze field gun used by the French army. Most European armies had employed similar pieces since the 18th century, including in the Napoleonic Wars. The U.S. Army adopted the weapon as the M1857 Gun-Howitzer, but it was better known as the "Napoleon." The name wasn't honorary – the cannon's designer was Louis Napoléon III, Emperor of the French! The M1857 was the main gun of both sides in the American Civil War. The North made about 1,180; the South, over 600.

Considered a light gun, the Napoleon mounted on a two-wheeled artillery carriage (2,600 lbs. with gun). This hooked up behind a two-wheeled limber (1,380 lbs.), which was drawn by six horses. The limber held the ammo chest, with 32 rounds, friction primers, and 6' of slow-match fuse (p. 187). The mount had limited elevation and thus range; the cannon's *theoretical* maximum range was 3,100 yards. The standard crew was seven.

Besides iron balls (in table), the Napoleon fired LE (Dmg 6d×5(0.5) pi++ with 6d [5d+2] cr ex linked), shrapnel (Dmg 6d pi+, Range 2,000, RoF 1×78, Rcl 1), and canister (Dmg 6d pi++, Acc 3, Range 80/600, RoF 1×27, Rcl 1). During the American Civil War, a friction primer and lanyard were used more often than match fuse for ignition.

Elswick 2.5" RML Mk I Screw-Gun, 2.5" Caplock (U.K., 1879-1889)

The Royal Artillery adopted the 2.5" Rifle, Muzzle-Loaded, Mark I – or 7-pounder – as a mountain gun. It disassembled for transportation on pack animals, the main parts being the 201-lb. breech assembly and the 199-lb. barrel. These components screwed together – the nickname "Screw-Gun" was inevitable. While popular, the piece was an outdated black-powder muzzleloader in the age of smokeless-powder breechloaders, and the heaviest mountain gun of its time. Its telltale smoke cloud didn't matter when battling "savages," but proved disastrous against the Boers in 1899-1902. The British retired it in 1903, but Indian soldiers still used it in WWI and Omani troops employed it in 1958.

Five mules could carry the disassembled gun and two-wheeled carriage (923 lbs. with gun) as five 250-lb. loads; ammunition required additional animals. A trained crew of seven could assemble and load the piece in 20 seconds. The mount had limited elevation – a distinct disadvantage in mountain artillery.

Besides LE (in table), the Screw-Gun fired shrapnel (Dmg 2d+1 pi+, Range 3,300, RoF 1×88, Rcl 1), canister (Dmg 3d pi+, Acc 3, Range 80/1,700, RoF 1×78, Rcl 1), and illumination (375-yard radius lasting 30 seconds). A 132-lb. ammo box held six LE, eight shrapnel, and eight canister rounds.

Schneider Mle 1897, 75×350mmR (France, 1898-1933)

The famous "French 75" – officially, the *Canon de 75mm Modèle 1897* – was the first modern artillery piece, breechloading and with full recuperation. The most widely used field gun of the early 20th century, some 17,000 were made. Greece, Poland, Romania, and Spain adopted it – as did the U.S., which acquired 4,300 as the M1897, beginning in 1917. The weapon saw use into WWII, and Third World countries such as Cambodia, Cameroon, and Mexico continued to field it in the 1980s.

Using Artillery

There are three ways to use artillery:

Direct Fire: Shooting at targets visible to the gunner at ranges up to around 3,000 yards. This is mainly done with TL5 artillery, and with TL6-8 tank, antitank, and antiaircraft guns. The gunner uses his Gunner skill (p. B198) for the attack roll, and the attack obeys *Ranged Attacks* (pp. B372-374) in all respects.

Observed Indirect Fire: Firing at targets that aren't visible to the gunner, who uses the Artillery skill (p. B178), as directed by an observer, who has the Forward Observer skill (p. B196). This is typical of TL6-8 artillery on the offense. The *Forward Observer* rules below *replace* the standard ranged-combat rules.

Predicted Indirect Fire: Attacking an area of ground, water, or air that the gunner can't see but that's identified on a map. This uses the Artillery skill and the rules under *Attacking an Area* (p. B414). This is often done by TL6-8 artillery on the defense or in preplanned surprise attacks (where the fire has been corrected *before* the battle begins), and by antiaircraft artillery. The gunner already knows what area he'll hit and suffers no -10 for firing blind, but he can't react to the target moving out of the "beaten zone."

Weapons other than cannon – notably mortars (pp. 145-147) and machine guns (pp. 129-137) – *can* use indirect fire. Use these rules for all weapon types.

Forward Observer

Indirect fire is essentially "blind" – the gunner can't see his target or the effects of his fire. He fires at -10 to skill and doesn't benefit from his gun's Acc. A forward observer (FO) acts as the gunner's eyes, directing the fire from far away. To do so, though, he *must* be able to talk to the gunner! He can shout over short distances, but he'll generally require a field telephone or a radio. The FO also has to know his location and that of the gun, which requires a Navigation roll.

Modifiers: +1 for a compass or +3 for a GPS system; -10 without a map.

Locating the *target* then requires a Forward Observer roll.

Modifiers: All Vision modifiers (p. B358) except ordinary range modifiers; a special range penalty of -3 per 500 yards or fraction thereof between FO and target, dividing range by the magnification of any vision aid *and* by two for a rangefinder (up to *its* maximum range) before assessing the penalty; the targeting program bonus for any fire-control computer (including a TL8 handheld model).

Locating the target and reporting its coordinates takes 2d+5 seconds. The gunner may then fire his first shot at -10, modified by the margin of success or failure on the Forward Observer roll. If the FO can observe the fall of the shot with respect to the target, he can provide the gunner with corrections on later shots; each correction requires another Forward Observer roll and 2d+5 seconds. Add the margin of the second roll to that of the first; failure *can* erase earlier bonuses. The FO may attempt as many rolls as necessary to whittle the -10 attack penalty down to 0, but can't give the gunner a bonus.

Critical success on any Forward Observer roll reduces the penalty to 0 immediately. Critical failure indicates a "friendly fire" incident of the GM's choosing. The FO might even bring rounds down on his *own* position!

Example: Corporal Calvin Knox is a FO with the Arkansas National Guard. He's looking at "The Thing" in Martha Johnson's kitchen garden. He has a grid map of the area and calls in corrections to his battery over a field telephone. His position is 1,500 yards from the target and he has 6× binoculars. Since 1,500/6 = 250, effective distance is under 500 yards, for -3. His Forward Observer skill is 14, so he rolls against 11. He gets a 10, succeeding by 1. The first shot is at -9 instead of -10.

A DX-based Forward Observer roll can replace any Artillery or Gunner roll to use a laser designator to guide a "smart" shell or bomb.

Time of Flight

Long-range artillery fire often takes a while to arrive at the target. Flight time is subject to many variables: projectile shape and weight, propellant charge, propellant temperature and pressure, barrel length and wear, air temperature and pressure, etc. Cannon fire high- and low-angle "missions"; this also impacts time of flight.

High-angle missions use a high trajectory in order to clear intervening obstacles. They're typical of mortars and heavy artillery firing at ranges over 3,000 yards. Low-angle missions follow a shallower trajectory, and arrive sooner and with fewer variables. Low-angle fire is typical of direct-firing tank guns, autocannon, and artillery at ranges up to 3,000 yards.

In reality, time-of-flight calculations are complicated and apply even to long-range small-arms fire. For game purposes, *ignore* the issue for small arms. For heavy weapons, it's reasonable – if imprecise – to use a flight time of one second per 500 yards for low-angle missions or one second per 250 yards for high-angle missions. Thus, it can take a *long* time for a round to reach its target – which might not even be there any more!

Example: The Arkansas National Guard executes a low-angle observed-fire mission using a battery of M1897 guns (pp. 138, 140). "The Thing" is 6,900 yards away, and 6,900/500 = 13.8, so it takes 14 long seconds for the shells to arrive. That's too late to save Corporal Knox from The Thing's tentacles . . .

Cannon Table

See pp. B268-271 for an explanation of the statistics. Empty Weight (EWt.) and Cost assume neither ammo nor mount, but ammo weight follows the slash as usual.

ARTILLERY (CANNON) (IQ-5) for indirect fire; GUNNER (CANNON) (DX-4 or other Gunner at -4) for direct fire

TL	Weapon	Damage	Acc	Range	EWt.	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
5	Greener Harpoon Gun, 1.5" Caplock	5d×2 imp	3	30/120	75/40	1	1(20)	26M	-8	5	$2,000	3	
5	Bourges Mle 1853, 12-pounder	6d×5 pi++	2	400/2,000	1,230/15	1	1(30)	52M	-13	5	$20,000	1	
5	Elswick "Screw-Gun," 2.5" Caplock *follow-up*	6d×5(0.5) pi++ 6d [3d-1] cr ex	4	630/4,000	400/7.4	1	1(30)	44M	-11	8	$10,000	1	
6	Schneider Mle 1897, 75×350mmR *follow-up*	6d×9(0.5) pi++ 5d×3 [4d-1] cr ex	5	2,100/6,900	1,008/20	1	1(3)	52M	-13	6	$40,000	1	
6	APX SA17, 37×94mmR *follow-up*	5d×2(0.5) pi++ 2d [2d] cr ex	4	520/3,300	260/1.4	1	1(3)	28M	-10	2	$15,000	1	
6	Rheinmetall 3.7cm PaK, 37×249mmR *follow-up*	7d×4(2) pi++ 2d [2d] cr ex	5+1	1,600/7,700	430/2.9	1	1(3)	38M	-10	4	$30,500	1	
6	RIA M2A1, 105×371mmR *follow-up*	6d×11(0.5) pi++ 5d×5 [5d+1] cr ex	5+2	4,100/12,200	1,064/40	1	1(4)	60M	-13	10	$327,000	1	
6	Rheinmetall KwK40, 75×495mmR *follow-up*	6d×10(2) pi++ 6d [4d-1] cr ex	6+1	2,700/8,900	1,090/23	1	1(3)	53M	-14	6	$72,500	1	
6	Watervliet M1, 76.2×539mmR *follow-up*	6d×10(2) pi++ 5d [4d-1] cr ex	5+1	4,900/16,100	1,200/24	1	1(3)	54M	-14	6	$65,000	1	
7	Watervliet M40, 106×607mmR *linked*	6d×6(10) cr ex 6d×4 cr ex	5+1	2,900/8,500	289/38	1	1(4)	24M	-12	1	$40,000	1	[1]
7	DTAT MR60CS, 60mm *follow-up*	7d×2(0.5) pi++ 9d [3d] cr ex	2+2	260/2,900	40/3.8	1	1(3)	18M	-7	2	$10,000	1	
7	Motovilikha D-81TM, 125×408mmR *linked*	6d×7(10) cr ex 6d×4 cr ex	5+3	3,500/10,300	4,180/73	1/8	22	84M	-16	10	$100,000	1	

Notes:

[1] Hazardous backblast (see description).

The Mle 1897 mounted on a two-wheeled carriage (2,509 lbs. with gun) with a DR 15 gun shield. It came with a two-wheeled limber (1,820 lbs.) that held 72 rounds. Carriage and limber were linked and drawn by four horses or a truck (p. 239). The original mount had limited elevation and thus range, which increased to 9,200 yards if the trail was dug in. Improved carriages, introduced in the 1930s, extended range to 12,800 yards and added a 4× scope (+2 Acc). The piece required a crew of seven.

The gun fired HE (in table), shrapnel (Dmg 2d-1 pi+, Range 6,100, RoF 1×270, Rcl 1), smoke (Dmg 6d×9(0.5) pi++, 20-yard radius lasting 2 minutes), mustard gas (Dmg 6d×9(0.5) pi++ with a 4d+2 cr ex follow-up, 20-yard-radius cloud lasting 1 minute), WP (Dmg 6d×9(0.5) pi++ with a 4d+2 [1d(0.2)] burn ex follow-up, 20-yard-radius cloud lasting 1 minute), and illumination (480-yard radius lasting 40 seconds). The U.S. Army also used an APEX round in WWII (Dmg 6d×6(2) pi++ with a 6d [4d-1] cr ex follow-up).

APX SA17, 37×94mmR (France, 1917-1935)

The SA17 was a quick-firing gun installed in WWI light tanks (p. 234) and in several French, Polish, and other armored vehicles between World Wars. Similar guns armed naval vessels. It was manually aimed and fired via a pistol grip and trigger, and typically loaded with HE (in table) or canister (Dmg 1d+1 pi++, Acc 3, Range 60/1,200, RoF 1×75, Rcl 1). APEX (Dmg 5d×2(2) pi++ with a 1d+2 [2d] cr ex follow-up) wasn't commonly used until the 1920s, while APHC (Dmg 5d×3(2) pi++) was issued from 1935.

Rheinmetall 3.7cm PaK, 37×249mmR (Germany, 1934-1941)

The *3.7cm Panzerabwehrkanone* ("3.7cm antitank gun"), often incorrectly called the PaK35/36, was Germany's main antitank weapon at the start of WWII. Its limited penetration quickly earned it the bitter nickname *Heeresanklopfgerät* ("army door knocker"), but despite early obsolescence, it saw action until the end – eventually providing fire support at the Atlantic Wall. Some 15,200 were acquired. The gun was employed during the Spanish Civil War, widely exported (to China, Hungary, Italy, and Turkey, among others), and license-made by Japan and Russia. Most of the era's 37mm antitank guns were either based on the 3.7cm PaK or comparable in performance. Some early WWII light tanks carried similar ordnance.

The 3.7cm PaK was mounted on a two-wheeled carriage (957 lbs. with gun) with a DR 15 gun shield and a 2.5× scope (+1 Acc). It required a crew of three. It fired APEX (in table), HE (Dmg 7d×4(0.5) pi++ with 3d [2d] cr ex linked), and – as of 1940 – APHC (Dmg 7d×4(2) pi++). A can holding 12 rounds weighed 55 lbs.

In 1942, an oversized "rifle grenade" (pp. 193-194) became available. The 18.7-lb. *StielGr41* had a 159mm HEAT warhead and was fired from the muzzle using a blank cartridge (Dmg 7d×2(10) cr ex with 7d×4 cr ex linked, Range 250/750).

RIA M2A1, 105×371mmR (USA, 1941-1983)

This howitzer was typical of 20th-century light artillery – most Western armies employed it or similar guns from the 1910s on. Over 10,200 were built for the U.S. military, and more for export to at least 60 countries. It was made in Canada, South Korea, and Taiwan. In 1960, it was renamed the M101. The U.S. Army replaced it in the late 1980s. In the 1990s, many American ski resorts received a few to fire rounds at mountainsides to knock snow loose and prevent avalanches!

The M2A1 was mounted on a two-wheeled carriage (4,475 lbs. with gun) with a DR 15 gun shield and a 4× scope (+2 Acc). It was drawn by a 2 1/2-ton truck (p. 239). The standard crew was seven.

The howitzer's primary round was HE (in table), but it also fired smoke (Dmg 6d×11(0.5) pi++, 34-yard-radius cloud lasting 3 minutes), WP (Dmg 6d×11(0.5) pi++ with a 5d [1d(0.2)] burn ex follow-up, 34-yard-radius cloud lasting 1 minute), illumination (800-yard radius lasting 1 minute), and leaflet (spreads 4"×6" leaflets over a 400-yard radius). In 1943, HEAT became available (Dmg 9d(10) cr ex with 6d×4 cr ex linked, Range 900/8,500) – and in 1965, beehive (Dmg 2d-1 cut, Range 12,700, RoF 1×8,000, Rcl 1). A wooden box holding two shells weighed 120 lbs.

The M2A1 was mounted on several self-propelled armored artillery vehicles. Shortened, it was also installed in the AC-130H Spectre and AC-130U Spooky gunship aircraft. A variant, the *M4* (1941-1945), armed some M4 Sherman tanks (p. 239): EWt. 955.

Rheinmetall 7.5cm KwK40, 75×495mmR (Germany, 1942-1945)

The *7.5cm Kampfwagenkanone 40* ("7.5cm fighting vehicle cannon model 1940") was installed in German medium tanks (pp. 238-239). It was sometimes known as the KwK40 L48 after its barrel length. German tank destroyers and antitank mounts bore nearly identical ordnance.

The low maximum range given for the KwK40 reflects the limited elevation of a tank mount; *theoretical* maximum range was 16,500 yards. Besides APEX (in table), it fired HE (Dmg 6d×10(0.5) pi++ with a 7d×3 [4d-1] cr ex follow-up) and HEAT (Dmg 6d(10) cr ex with 4d×4 cr ex linked). A wooden box held three rounds (82 lbs.).

Watervliet M1, 76.2×539mmR (USA, 1942-1945)

The "76mm" M1 was installed in American medium tanks (p. 239) and tank destroyers. It fired APEX (in table) and HE (Dmg 6d×12(0.5) pi++ with a 6d×2 [4d-1] cr ex follow-up). The British ROQF Mk V was similar, and used the same ammo.

Watervliet M40, 106×607mmR (USA, 1953-1970)

The M40 was a heavy counterblast recoilless rifle (see *Light Antitank Weapons,* pp. 147-149). The U.S. used it during the Korean and Vietnam Wars, and exported it widely. It was also made in Brazil, India, Iran, Israel, Japan, Pakistan, South Korea, and Spain.

The M40 mounted on a 194-lb. tripod or a vehicle (typically a jeep, pp. 236-237). To aim, the gunner used the built-in 3× scope (+1 Acc) and 12.7×77mm M8C spotting rifle (included in weight). The semiautomatic M8C was fixed coaxially with the gun barrel and fired a SAPHE-T bullet: Dmg 8d pi+ with a 1d [1d-2] cr ex follow-up, Acc 5+1, Range 1,300/5,500, RoF 3, Shots 10(3). If it hit the target – resulting in a flash and a puff of smoke – the gunner knew the M40 was lined up and could fire the main barrel with the assurance that the shell would strike the intended target (+4 to Gunner skill). In 1997, an 11-lb. computer sight (+2 Acc scope, +3 Acc laser rangefinder, Night Vision 7, +1 Gunner, p. 157) became available.

> *No two guns of the same caliber and design ever shoot the same. This is still true today, even with the great technological advances of the last two centuries.*
>
> *– Kevin Kiley,* ***Artillery of the Napoleonic Wars***

Besides HEAT (in table), the M40 fired HESH (Dmg 6d×7(0.5) pi++ with 8d×5 cr ex linked) and, from 1965, beehive (Dmg 2d+2 cut, Range 3,300, RoF 1×6,000, Rcl 1). In the 1990s, an MS-HEAT shell was offered (Dmg 6d×2(10) cr ex with a 6d×7(10) cr ex follow-up and 6d×4 cr ex linked). A wooden box holding two shells weighed 134 lbs. The weapon had a significant backblast (p. 147): 7d×2 burn.

DTAT MR60CS 61, 60mm (France, 1961-1970)

The *Mortier à 60mm Cloche Special Modèle 1961* was a breechloading, trigger-fired gun/mortar installed in armored cars (p. 240) and boats. It was capable of both direct and indirect fire. It fired HE (in table), HEAT (Dmg 4d×4(10) cr ex with 6d cr ex linked), buckshot (Dmg 1d+1 pi, Range 40/900, RoF 1×132, Rcl 1), smoke (Dmg 5d×2(0.5) pi++, 15-yard-radius cloud lasting 2 minutes), and illumination (300-yard radius lasting 30 seconds).

Motovilikha D-81TM Rapira, 125×408mmR (Russia, 1977-)

Also known as the 2A46M, Degtyarev's *Rapira* ("Rapier") is a smoothbore gun installed in various Russian main battle tanks (p. 244). It's usually linked to a 22-round autoloader, which feeds two-part, semi-consumable cased (p. 164) ammo with a metal base cap. The weapon has also been produced in Czechoslovakia, India, Iraq, Poland, Romania, and Yugoslavia.

Besides HEAT (in table), it fires APFSDS (Dmg 6d×30(2) pi++ inc) and HE (Dmg 6d×19(0.5) pi++ with a 6d×6 [6d+1] cr ex follow-up). In 1982, APFSDSDU became available (Dmg 6d×33(2) pi++ inc); in 1988, MS-HEAT (Dmg 6d×2(10) cr ex with a 6d×7(10) cr ex follow-up and 6d×4 cr ex linked); and as of the 1990s, MF (Dmg 3d pi-, Range 150/1,800, RoF 1×4,800, Rcl 1).

Grenade Launchers

The "hand mortar," an idea almost as old as gunpowder, is a TL4 innovation. At TL7, it's revived to develop a weapon more accurate than rifle grenades (pp. 193-194) to bridge the gap between the maximum range of thrown hand grenades (pp. 190-193) and the minimum range of mortars (pp. 145-147). The resulting firearm, dubbed the "grenade launcher," fires projectiles that bear no resemblance to hand or rifle grenades. The TL7 or TL8 grenade launcher fires stubby cartridges – developed from TL6 flare-pistol rounds – that can carry a wide variety of warheads.

Grenade launchers grow in popularity at mid-TL7, driven by the introduction of designs that can mount under a rifle barrel without interfering excessively with the gun's handling. Multi-shot and automatic versions soon follow. By TL8, grenade launchers are the most important small-unit support weapons after MGs. With less-than-lethal munitions, they also see widespread antiriot use.

Walther Leuchtpistole, 26.5×103mmR (Germany, 1934-1944)

The *Leuchtpistole* ("flare pistol") was a smoothbore, break-open pistol used widely by the German military and merchant marine. Hundreds of thousands were adopted or copied by other armies, and many nations introduced similar devices. Its 40 different signal cartridges included illumination (100-yard radius lasting 30 seconds), colored flares, signal smoke, and whistling rounds (indicating gas attack). By 1942, HEAT (Dmg 4d(10) cr ex with 3d cr ex linked), HE (Dmg 2d+1 [1d+1] cr ex), and HE-AB (Dmg 2d+1 [1d+1] cr ex, Range 10) were available. The HE-AB shell was intended for close defense of the dead angles of tanks and bunkers. Fired out of a hatch, it exploded about 6' above the ground, 10 yards away.

The German navy also used the Walther *SLD* (1936-1945), a double-barreled, stainless-steel pistol: Wt. 6.3/0.4, RoF 2, Shots 2(3i), Bulk -3, Cost $650. Both barrels can be fired simultaneously at no penalty. Loaded with army-issue HE or HEAT rounds, it would be a potent weapon . . .

Colt M79, 40×46mmSR (USA, 1961-1971)

The first modern grenade launcher – nicknamed "Blooper" or "Thumper" for the noise it made – was a simple, hinged-breach device resembling a big-bore, single-barreled shotgun. While reasonably accurate, it had the disadvantage that the grenadier was effectively armed with a single-shot weapon. The M79 was standard issue for U.S. troops in Vietnam until superseded by underbarrel designs. Some 350,000 were made and widely exported. It was also produced in South Africa and South Korea. For projectiles other than HE, see *Grenade Launcher Ammo* (p. 143).

Colt M203, 40×46mmSR (USA, 1969-)

This launcher mounts under the barrel of M16-series rifles (p. 117). Like those weapons, it's widely exported. The M203 has been license-made or duplicated in Canada, China, Egypt, Iran, Italy, South Korea, and Turkey; copies are frequently modified to mount under other rifles, such as the Chinese QBZ95, Egyptian AKM, or Turkish G3A3. The M203 fires the same rounds as the M79 (above), but the breechloading design – which involves sliding the barrel forward to load – means it cannot use long grenades.

The RM Equipment *M203PI* (1987-) is more flexible and can mount under a variety of shoulder arms, including the Steyr AUG (p. 118) and H&K MP5A3 (p. 123): Wt. 2.7/0.5.

The *M203A2* (1999-) is a shorter, quick-detach launcher that mounts under the Colt M4A1 (pp. 119-120) on a rail (p. 161): Wt. 3.1/0.5.

The TAPCO *CM2037* (1991-) is a smoothbore copy chambered in 37×122mmR, which means that civilians can own it without paperwork: Wt. 4.7/0.37, Cost $225, LC3.

See *Grenade Launcher Ammo* (p. 143) for warheads other than HE, and to learn which rounds are "long" and/or available in 37×122mmR.

Buck HAFLA DM34, 35mm (Germany, 1970-)

The *Handflammpatrone* ("hand flame cartridge") is a pocket incendiary: a simple, disposable aluminum barrel that launches a red phosphorus-filled grenade. The Belgian and German armies adopted it – mainly to blind tanks – and issued it in a 4.1-lb. plastic pouch holding three. They retired it in the early 21st century. The HAFLA DM34 has a folding handle and trigger, and takes two Ready maneuvers to prepare for firing. Treat the projectile as WP (p. 172), with a 7-yard-radius smoke cloud lasting one minute.

KBP AGS-17 Plamya , 30×28mmB (Russia, 1971-1994)

The *Automatischeskyi Granatomyot Stankovyi-17 Plamya* ("mounted automatic grenade launcher-17 Flame") was a selective-fire weapon that mounted on a 26-lb. tripod ($3,000). It was widely exported, and also made in Bulgaria, China, and Serbia. The AGS-17 fed from a 29-round disintegrating belt (20.2 lbs., or 31.9 lbs. in drum) and fired HE-SD. It had a 2.2-lb. 2.7× scope (+1 Acc).

H&K HK69A1, 40×46mmSR (Germany, 1976-)

The HK69A1 is a break-open grenade launcher with a retractable stock – the German equivalent of the M79 (see above). As the *Granatpistole* ("grenade pistol") or GraPi, it was the German military's squad grenade launcher from the late 1970s until superseded by the AG36 (p. 144). It can be carried in a belt holster. Look for it in the film *Ronin*.

The *Mehrzweckpistole 1* ("multi-purpose pistol 1"), or MZP1, is a variant in widespread service as a police weapon. Both 40×46mmSR and 37×122mmR versions are available. For details on ammo types, see *Grenade Launcher Ammo* (p. 143).

KBP GP-25 Kostyor, 40mm VOG-25 (Russia, 1979-)

The *Granatomyot Podstvolnyi-25 Kostyor* ("underbarrel grenade launcher-25 Bonfire") mounts under the AK-74 and other Kalashnikovs (p. 114). It has been widely exported, and also made in Bulgaria, Pakistan, and Serbia. The GP-25 is a muzzleloader, like a mortar, and the grenade is "caseless" in that the propellant is contained in the hollow rear of the grenade. It fires HE (in table), smoke (8-yard-radius cloud lasting 30 seconds), baton (Dmg 1d+1(0.5) cr dkb, Range 20/250), and tear gas (Dmg 1d+1(0.5) cr dkb, 8-yard-radius cloud lasting 20 seconds). In 2001, HEDP became available (Dmg 5d-1(10) cr ex with 4d [2d] cr ex linked).

Saco MK 19 MOD 3, 40×53mmSR (USA, 1980-)

The U.S. and many export countries introduced the MK 19 MOD 3 automatic grenade launcher on a large scale. Egypt and South Korea make it under license. It arms HMMWVs (pp. 242-243), trucks, APCs, boats (pp. 241-242), and helicopters (pp. 240-241). With a 21-lb. cradle adapter, it can mount on the 44-lb. tripod ($3,500) of the Browning M2HB (p. 133) as well.

The MK 19 MOD 3 feeds from a disintegrating belt in a can clamped to the gun, holding either 32 rounds (25.4 lbs., or 44 lbs. in can) or 48 rounds (38 lbs., or 61.6 lbs. in can). While HE grenades are available (Dmg 5d [2d] cr ex), the usual load is HEDP (in table). In 2001, an MF round became available (Dmg 1d-1 pi-, Range 100/1,200, RoF 6×115, Rcl 1) – and in 2002, an ABF round (Dmg 1d-2 pi-, Range 2,200, RoF 6×400, Rcl 1). The weapon can mount a 7.5-lb. 6.5× night sight (+2 Acc and Night Vision 5, 2×XS/30 hrs.) or, from 1997, a 5.5-lb. 10× thermal sight (+3 Acc and Infravision, M/12 hrs.).

The original NOSL *MK 19 MOD 0* (1967), used on patrol boats (pp. 241-242) during the Vietnam War, had Malf. 16, EWt. 46, and RoF 8, and fired only HE.

Milkor MGL, 40×46mmSR (South Africa, 1983-)

The MGL has a clockwork-powered revolver cylinder, a folding stock, and an integral collimating sight (+1 to skill). More than 33,000 have been made, and it's copied in Croatia and India. Many Third World police and military forces use it. It can't chamber long grenades.

The improved *MGL-140* (2005-), license-made in the U.S. and adopted as the M32 by the U.S. Marine Corps, *can* fire long grenades, and also features sight and accessory rails (p. 161): Wt. 16.2/3.

See *Grenade Launcher Ammo* (see box) for projectiles other than HE, and to learn which rounds are considered "long."

Hawk MM1, 40×46mmSR (USA, 1984-1999)

A rare civilian design intended for police, the MM1 had a spring-loaded 12-shot revolver cylinder, a pistol foregrip, and no shoulder stock. Reloading was slow (three Ready maneuvers to put each grenade in its chamber, plus four Ready maneuvers to wind the spring). Both 40×46mmSR and 37×122mmR versions were available, but only the 37mm model could chamber long rounds; see *Grenade Launcher Ammo* (see box). Few MM1s were made – but look for it in *Terminator 2.*

The MM1 was a development of the *Manville Gas Gun* (1938-1943), which fired 1" flare cartridges: Dmg 1d+1(0.5) cr, Range 30/100, Wt. 18.8/3.2, Shots 18(5i), ST 11†, LC4. Only tear gas rounds (4-yard-radius cloud lasting 20 seconds) were made for it. This weapon arms the mercenaries in the film *The Dogs of War,* loaded with a fictional HE grenade: Dmg 2d+1 [1d+1] cr ex.

Grenade Launcher Ammo

The following rounds are available for 40×46mmSR grenade launchers. An asterisk (*) means the ammo is also available in 37×122mmR, with the same stats. A dagger (†) indicates a long warhead that won't fit into all launchers; check the weapon description. For RoF, *n* is the weapon's RoF when firing its usual ammo (see *Grenade Launchers Table,* p. 145). A box of 72 40×46mmSR grenades weighs 54 lbs.

Baton†* (p. 168). A rubber baton: Dmg 1d+1(0.5) cr dkb, Range 10/110. $10. LC3.

*Beanbag** (p. 168). A pellet-filled sack: Dmg 1d+1(0.2) cr dkb, Acc 0, Range 10/150. $15. LC3.

Camera†. This unique round, available from 2005, fires a parachute-supported miniature digital camcorder (p. 43) that can transmit live images from directly below it for up to five minutes. Transmission range is one mile. $400. LC4.

HE (p. 169). The weapon table assumes standard TL7 HE shells. A TL8 shell, with improved fuse and filler, has Dmg 6d+2 [2d] cr ex. $10. LC1.

HEDP (p. 170). The TL7 HEDP round the U.S. military introduced in 1971 has Dmg 4d(10) cr ex with 4d+2 [2d] cr ex linked. The improved TL8 round, available since the 1980s, has Dmg 7d(10) cr ex with 6d [2d] cr ex linked. $20. LC1.

HEDP, Extra-Powerful † (p. 170). In 2006, a TL8 HEDP round with the extra-powerful option (p. 165) became available: Dmg 7d(10) cr ex with 6d [2d] cr ex linked, Range 30/880. Multiply ST by 1.2. $30. LC1.

Illumination†* (p. 171). This parachute flare illuminates a 185-yard radius for 40 seconds. At close range, before it deploys, it inflicts 1d+1(0.5) cr dkb. $25. LC4.

Multi-Flechette (MF) (p. 174). The U.S. military tested this in the 1960s, but didn't adopt it: Dmg 1d-3 pi-, Acc 2, Range 100/1,200, RoF *n*×45, Rcl 1. $20. LC3.

Net†.* Available from 1999, this round bursts a few feet from the muzzle and releases a weighted 10'×10' net of aramid fiber strands to catch animals or humans (up to SM 0). The target is caught in the net (see *Nets,* p. B411) and suffers stun effects from the deployment explosion (treat as a stun grenade; see *Schermuly Stun Grenade,* p. 193). Range 10. At ranges under 5', the unexploded projectile inflicts 1d+1(0.5) cr dkb. $50. LC3.

*Rubber Shot** (p. 174). In 2001, the U.S. Army adopted a rubber shot round: Dmg 1d-3(0.2) cr, Acc 2, Range 20/120, RoF *n*×48, Rcl 1. $10. LC3.

Shot (p. 173). A TL7 birdshot round has Dmg 1d-1(0.5) pi-, Acc 2, Range 30/600, RoF *n*×20, Rcl 1. An improved TL8 version has Dmg 1d-1(0.5) pi-, Acc 2, Range 30/600, RoF *n*×50, Rcl 1. $5. LC3.

Silent HE. In 1967, the U.S. Navy SEALs tested a HE grenade with the "silent" option (p. 165): Dmg 4d+1 [2d] cr ex. Range is unchanged. $100. LC1.

Smoke†* (p. 171). Available in several colors: Dmg 1d+1(0.5) cr dkb, 8-yard-radius cloud lasting 25 seconds. $15. LC3.

Tear Gas†* (p. 171). Produces an 8-yard-radius cloud lasting 20 seconds. A direct hit inflicts Dmg 1d+1(0.5) cr dkb. $15. LC3.

Thermobaric† (p. 170). In 2004, the U.S. Army introduced a thermobaric round: Dmg 8d cr ex. $40. LC1.

Foster-Miller WebShot Launcher, 37×122mmR (USA, 1999-2004)

The WebShot Launcher is a disposable, one-shot launcher for a net grenade (p. 143). Each factory-loaded unit consists of a sealed, smoothbore barrel with a folding pistol grip/trigger. It is 1' long when unfolded and prepared for firing (two Ready maneuvers). Police agencies in Japan, South Korea, and the U.S. acquired either this device or a net round to use in their existing grenade launchers.

H&K AG36, 40×46mmSR (Germany, 1999-)

The AG36 is an underbarrel grenade launcher designed for the H&K G36 rifle and G36K carbine (p. 121). It has its own pistol grip and is side-opening, allowing it to accept grenades of all lengths. For rounds other than HE, see *Grenade Launcher Ammo* (p. 143). The AG36 is in service with the German and other militaries. More than 30,000 have been made, including minor export variants. The *L17A2* (2003-) attaches to the Enfield L85A2 (see *Enfield L85A1,* p. 118); the *M320* (2006-), to the Colt M4A1 (pp. 119-120) and M16A4 (see *Colt M16A1,* p. 117).

GD M307, 25×59mmB (USA, 2008-)

This lightweight automatic grenade launcher is scheduled to replace the U.S. military's M2HB machine gun (p. 133) *and* MK 19 MOD 3 grenade launcher (p. 143). It can mount on a 13-lb. tripod ($2,550) and on vehicles – including trucks, APCs, boats, and helicopters. Its double trigger lets the shooter change fire modes instantly (see *Automatic Weapons,* pp. 82-83).

The M307 feeds from a disintegrating belt in a can clamped to the side, which holds 31 rounds (13.4 lbs., or 16 lbs. in can). In addition to HEDP (in table), it fires HE-AB (Dmg 3d [1d+1] cr ex) and thermobaric-AB (Dmg 6d cr ex). It includes an 8.6-lb. computer sight (M/32 hrs.) with 3× magnification (+1 Acc), thermal imaging (Infravision), a head-up display (HUD) for annotated systems information

Individual Combat Weapon

The TL8 "individual combat weapon" combines a grenade launcher with a short-ranged automatic weapon, fused ammunition, and a full-solution fire-control system.

ATK-H&K M29, 20×28mm (USA, 2008-)

A consortium headed by ATK of the U.S. and H&K of Germany developed this design for the U.S. Army as the XM29 Objective Individual Combat Weapon (OICW). It was to enter service as the M29 ICW in 2008, but the project was canceled in 2005 due to weight, effectiveness, and budget problems. It appears in *Die Another Day.*

The semiautomatic grenade launcher component is a bullpup design that feeds from a plastic magazine. Ejection can be switched from right to left, making it fully ambidextrous. It fires a 20×28mm HE-AB grenade with four fuse modes:

- *Airburst.* The main mode (on table), intended for attacking foes behind cover. The grenade explodes in the air, showering fragments from above; see *Airburst* (pp. 174-175). The shooter can select the distance at which it bursts.
- *Impact.* The grenade detonates on impact – a direct point attack.
- *Delayed Impact.* Allows shooting through light doors, etc. The grenade explodes immediately behind the obstacle.
- *Window.* Used to fire into buildings from the outside. The grenade detonates inside, 1.5 yards behind the exterior wall.

The latter three modes use Dmg 3d(0.5) cr with a 1d+1 [1d] cr ex follow-up. In any mode, the grenade must travel a minimum range of 30 yards before it arms. A HEDP round wasn't planned, but would have Dmg 4d(10) with 1d [1d] cr ex linked.

The underbarrel component is a 5.56×45mm carbine based on the H&K G36 (p. 121): Dmg 4d pi, Acc 4+2, Range 600/2,500, Wt. 15/1, RoF 6, Shots 30+1(3), ST 10†, Bulk -6, Rcl 2. It uses M16-type magazines. Fire modes include single shots and two-round limited bursts. The carbine detaches (takes three Ready maneuvers) for use by itself, but then lacks a shoulder stock: Acc 3, Wt. 5.1/1, ST 9†, Bulk -3.

The weapon includes a 2.5-lb. mini-computer sight (2×S/10 hrs.), which features 2× optical magnification (+1 Acc), a video channel with 2× zoom and thermal imaging (+1 Acc and Infravision), a head-up display (HUD) for annotated systems information and the ballistic solution reticle, a 2,200-yard laser rangefinder (+3 Acc, requires one Ready maneuver to use), and a targeting program (+1 Guns, needs one Ready maneuver to program the grenade). The user chooses the fuse mode and lases the target for range, an induction ring in the chamber programs the grenades, the computer displays the new aiming point, and the grenadier fires. The video camera can send images to the soldier's HUD or, via radio, to upper echelons.

Grenade Launchers Table

See pp. B268-271 for an explanation of the statistics. For launchers that use the Gunner skill, Empty Weight (EWt.) and Cost assume neither ammo nor mount (e.g., a tripod), but ammo weight follows the slash as usual; see the weapon description for details. For those that use Guns, Weight *includes* ammunition.

GUNNER (MACHINE GUN) (DX-4 or other Gunner at -4)

TL	Weapon	Damage	Acc	Range	EWt.	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
7	KBP AGS-17, 30×28mmB	4d [1d+2] cr ex	2+1	35/1,900	68/32	6	29(5)	20M	-7	2	$11,000	1	[1]
8	Saco MK 19 MOD 3, 40×53mmSR	4d(10) cr ex	2	35/2,200	75/44	6	32(5)	21M	-8	2	$17,500	1	[1]
	linked	4d+1 [2d] cr ex											
8	GD M307, 25×59mmB	4d+2(10) cr ex	3+3	30/2,200	39/16	4	31(5)	17M	-7	2	$20,000	1	[1, 2]
	linked	3d-1 [1d+1] cr ex											

GUNS (GRENADE LAUNCHER) (DX-4 or most other Guns at -4)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
6	Walther Leuchtpistole, 26.5×103mmR	Spec.	1	10/330	1.8/0.2	1	1(3)	8	-2	2	$480	3	[1, 3]
7	Colt M79, 40×46mmSR	4d-1 [2d] cr ex	1	30/440	6.5/0.5	1	1(3)	8†	-4	2	$500	1	[1, 4]
7	Colt M203, 40×46mmSR	4d-1 [2d] cr ex	1	30/440	4.1/0.5	1	1(3)	9†	–	2	$1,250	1	[1, 5]
7	Buck HAFLA, 35mm	1d-2 [1d(0.2)] burn ex	0	10/90	1.4	1	1	5†	-2	2	$100	1	[1]
7	H&K HK69A1, 40×46mmSR	4d-1 [2d] cr ex	1	30/440	6.3/0.5	1	1(3)	8†	-4*	2	$1,550	1	[1, 4]
7	KBP GP-25, 40mm	4d+2 [2d] cr ex	1	25/440	3.9/0.55	1	1(3)	9†	–	2	$500	1	[1, 5]
8	Milkor MGL, 40×46mmSR	4d-1 [2d] cr ex	1	30/440	15.3/3	3	6(3i)	10†	-6*	2	$1,500	1	[1, 4]
8	Hawk MM1, 40×46mmSR	4d-1 [2d] cr ex	1	30/440	18.5/6	3	12(3i)	10†	-6	2	$2,000	1	[1, 4]
8	Foster-Miller WebShot, 37×122mmR	Spec.	1	1/10	1.6	1	1	6†	-2	2	$100	2	[1, 6]
8	H&K AG36, 40×46mmSR	4d-1 [2d] cr ex	1	30/440	3.8/0.5	1	1(3)	9†	–	2	$1,550	1	[1, 5]
8	ATK-H&K M29, 20×28mm	1d+1 [1d] cr ex	3+3	30/2,200	15/1.6	2	6+1(3)	11†	-6	3	$12,000	1	[1, 2, 4]

Notes:

[1] First Range figure is *minimum* range, not 1/2D.
[2] Accessory rail (p. 161).
[3] Lanyard ring (p. 154).
[4] Sling swivels (p. 154).
[5] Clamps under rifle or carbine: add weight to weight of host weapon and add -1 to weapon's Bulk.
[6] See *Grenade Launcher Ammo* (p. 143) for details.

and the ballistic solution reticle, a 4,400-yard laser rangefinder (+3 Acc, requires one Ready maneuver to use), and a targeting program (+1 Gunner, needs one Ready maneuver to program the round).

Exchanging bolt, feed, and barrel – which takes five minutes and an Armoury (Heavy Weapons) roll – converts the M307 into a HMG that fires .50 Browning: Dmg 7d×2 pi+, Acc 5+3, Range 1,800/7,600, EWt. 30.6/35, RoF 4, Shots 100(5), ST 16M, Bulk -8, Rcl 2.

Mortars

Mortars are short-barreled cannon used for high-trajectory indirect fire. The earliest versions, at TL4, were massive bombardment pieces intended mainly for sieges. At TL6, the mortar becomes an entirely different weapon.

The defining feature of the TL6-8 mortar remains its indirect-fire capability, but it's a much lighter piece, often man-portable. The bombs it hurls are more effective than gun artillery shells of similar caliber. It's typically fired by dropping rounds down the tube, allowing high rates of fire for short periods – again, outperforming equivalent gun artillery. However, mortars can't match the range and precision of gun artillery.

Stokes ML 3" Mk I, 81mm (U.K., 1916-1936)

The British Stokes 3" (actually 3.2") trench mortar was the first modern mortar. It was a simple, influential design. Similar weapons were later produced in almost every country with any sort of industrial base.

The Stokes 3" consisted of a smoothbore tube (43 lbs.) with a fixed firing pin, resting on a small base plate (28 lbs.) to keep recoil from driving it into the ground, and supported by a bipod (37 lbs.). It required a three-man crew. The gunner simply dropped rounds down the tube; the bombs fired as they strike the pin. The only widely issued ammo was HE (in table).

The U.S. Army's Watervliet *M1* (1937-1945) was of the improved Stokes-Brandt Mle 1927/31 pattern, developed in France and licensed worldwide: EWt. 136. It disassembled into barrel (44.5 lbs.), bipod (46.5 lbs.), and base plate (45 lbs.). It could be transported on a 71-lb. hand cart (see *Pulling and Dragging,* p. B353). Two 81mm HE shells were available for the M1, a light bomb (Dmg 6d×2 [4d] cr ex, Max 3,300, WPS 6.9) and a heavy bomb (Dmg 6d×4 [4d] cr ex, Max 2,600, WPS 10.6), along with WP (Dmg 4d [1d(0.2)] burn ex, 23-yard-radius cloud lasting 1 minute).

82-BM-37, 82mm (Russia, 1937-1955)

The *82mm Batalyonny Minomyot obrazets 1937g* ("82mm battalion mortar model 1937") – another Stokes-Brandt pattern – was typical of Russian designs used from the 1930s on. Widely exported, it was also copied in Bulgaria, China, Egypt, and Poland. It saw heavy service in Korea, Vietnam, and various African and Middle Eastern wars.

The 82-BM-37 fired HE (in table), smoke (23-yard-radius cloud lasting 2 minutes), and illumination (550-yard radius for 35 seconds). A case with three bombs weighed 26 lbs. Eastern 82mm mortars could also fire Western 81mm bombs, but not vice versa. The weapon required a three-man crew.

Royal Ordnance ML 2" Mk II, 51mm (U.K., 1938-1945)

Designed for the British Army by the Spanish manufacturer ECIA, this mortar was an extremely simple device for squad-level use. Commonwealth infantry used it from WWII until the 1980s. It's *still* manufactured in India.

The 2" mortar consisted of a short, smoothbore tube with a tiny spade for a base. It had no sights; the only targeting aid was a white line painted down the length of the tube, and the gunner adjusted fire by observing the rounds falling. It was fired by trigger – not by dropping bombs down the tube. In addition to HE (in table), it lobbed smoke (12-yard-radius cloud lasting 70 seconds), colored flares, and illumination (270-yard radius lasting 45 seconds).

The Watervliet *M3* (1942-1945) was a licensed variant installed in American tank turrets to provide smoke cover: EWt. 18, ST 14M. It had three fixed ranges: 35, 75, and 150 yards.

The Royal Ordnance 51mm *L10A1* (1981-1988) is the modern replacement for the 2" mortar: Dmg 8d [2d+2] cr ex, Range 55/900, EWt. 13.8/1.7.

120-PM-38, 120mm (Russia, 1938-1943)

The *120mm Polkovoy Minomyot obrazets 1938g* ("120mm regiment mortar model 1938") was about as big as an infantry mortar could get and still be mobile. It was normally towed on a two-wheeled, 495-lb. carriage, with a light truck as prime mover. It disassembled into three loads for pack-animal transport: barrel (220 lbs.), bipod (136 lbs.), and base plate (207 lbs.). It was copied in Germany and Romania.

In addition to HE (in table), the 120-PM-38 fired smoke (42-yard-radius cloud lasting 2 minutes), WP (Dmg 6d [1d(0.2)] burn ex, 42-yard-radius cloud lasting 1 minute), and illumination (500-yard radius lasting 45 seconds). A box of two bombs weighed 88 lbs. The mortar required a three-man crew.

A cheaper replacement, the *120-PM-43* (1943-1955), was distributed all over the Communist world: EWt. 605. It was also made in China and Egypt.

Watervliet M2, 60mm (USA, 1938-1942)

The M2 was typical of the light mortars fielded by most armies from the 1930s on. A licensed copy of the French Stokes-Brandt Mle 1935, it was itself copied widely. The Americans encountered Chinese-made versions in Korea and Vietnam.

The mortar disassembled into three parts for transport: barrel (12.8 lbs.), bipod (16.4 lbs.), and base plate (12.8 lbs.). The tube could even be braced against the ground and fired *without* its bipod or plate (Acc 0, ST 10†). This portability led to the M2 and similar light mortars becoming popular with guerrillas.

The M2 fired HE (in table), WP (Dmg 2d [1d(0.2)] burn ex, 15-yard-radius cloud lasting 1 minute), and illumination (350-yard radius lasting 30 seconds). A wooden box holding 10 bombs weighed 49 lbs.

Hotchkiss-Brandt Commando, 60mm (France, 1966-)

Even lighter and more portable than earlier 60mm light mortars, the Commando is designed for fast-moving light-infantry forces. It gives raiding parties, patrols, and small advisory groups effective support without compromising their mobility. Its low weight decreases accuracy and range, but it's a support weapon that can go anywhere with the troops (Holdout -4). Similar designs are made worldwide.

The Commando lacks both bipod and elaborate sights, but has a bubble sight and a sling with range markers to allow for correct elevation. The firer holds the tube with one hand, grasping the canvas hand-protector wrapped around the barrel, and drops bombs with the other. The Commando fires HE (in table), smoke (15-yard-radius cloud lasting 1 minute), and illumination (350-yard radius lasting 35 seconds).

Mortars Table

See pp. B268-271 for an explanation of the statistics. Empty Weight (EWt.) and Cost *exclude* ammo but *include* any bipod or base plate mentioned in the weapon description; ammo weight follows the slash as usual.

ARTILLERY (CANNON) (IQ-5)

TL	Weapon	Damage	Acc	Range	EWt.	RoF	Shots	ST	Cost	LC	Notes
6	Stokes ML Mk I, 81mm	6d×3 [4d] cr ex	2	275/1,600	108/11.7	1	1(4)	21M	$5,000	1	[1]
6	82-BM-37, 82mm	6d×2 [4d] cr ex	2	110/3,400	123/7.4	1	1(3)	21M	$6,000	1	[1]
6	RO ML Mk II, 2"	6d [2d+2] cr ex	1	50/530	9/2.25	1	1(2)	9†	$500	1	[1]
6	120-PM-38, 120mm	6d×5 [6d] cr ex	3	500/6,500	563/35.2	1	1(5)	32M	$16,000	1	[1]
6	Watervliet M2, 60mm	7d [3d] cr ex	2	100/2,000	42/3.2	1	1(2)	15M	$2,500	1	[1]
7	Hotchkiss-Brandt Commando, 60mm	9d [3d] cr ex	1	100/1,200	17/3.2	1	1(2)	11†	$750	1	[1, 2]
8	PRB FLY-K, 52mm	8d [2d+2] cr ex	2	220/770	10/1.7	1	1(2)	8†	$900	1	[1, 2]

Notes:

[1] First Range figure is *minimum* range, not 1/2D.

[2] Sling swivels (p. 154).

PRB NR8113 FLY-K, 52mm (Belgium, 1983-1990)

The FLY-K is perhaps the most unusual modern mortar: it uses the captive-piston principle to fire without smoke or flash, and with little noise (see *Silent Ammunition,* p. 165), concealing the firer's position. The propellant is consumed entirely within the shell. Lightweight and compact (Holdout -4), with a simple but effective spirit sight, the FLY-K is an ideal choice for ambushers, assassins, and deep-penetration patrols. It wasn't a commercial success, but it has been license-made in France since the 1990s, and the French army adopted it as a squad-level weapon. Besides HE (in table), it fires WP (Dmg 2d [1d(0.2)] burn ex, 12-yard-radius cloud lasting 1 minute) and illumination or IR-illumination (275-yard radius lasting 30 seconds).

Light Antitank Weapons

At early TL7, the dominance of armored fighting vehicles spurs the development of light antitank weapons (LAWs) for infantry. Most designs use shaped-charge (HEAT) warheads, which are ideal for penetrating heavy armor even at maximum range. Alongside these warheads appear two man-portable means of delivering them: the *rocket launcher* and the *recoilless rifle.*

An infantry rocket launcher consists of an unguided rocket fired from a lightweight tube. A recoilless rifle is a light cannon that's open at both ends; this allows a blast of high-velocity gas vented out the back (known as *counterblast*) to balance the recoil of a shell fired out the front. Some TL8 weapons eject less-hazardous metal powder, plastic flakes, or water (called *countermass*) instead. See also *Backblast* (see box).

Both types of LAW are light enough for one man to carry and fire – although often, an assistant carries spare ammo and helps reload. Rocket launchers are the cheaper and lighter of the two, while recoilless rifles are more accurate and tend to have a wider selection of ammo types. Weapons of both varieties are in widespread use throughout TL7-8.

GE M1A1 Bazooka, 2.36" (USA, 1943-1944)

This simple rocket launcher was the first LAW, firing a 2.36" (60mm) rocket with a HEAT warhead. Cobbled together by an American ordnance officer, it was nicknamed "Bazooka" after the improvised musical instrument of a then-popular comedian. Half a million were made.

The Bazooka's stock held the batteries required for ignition (2×S), plus two spares. A HEAT rocket costs $215; three came in a carrying bag. Backblast: 1d+1 burn.

The *M20 Super Bazooka* (1950-1957) was a larger launcher that fired a 3.5" (89mm) rocket: Dmg 7d×3(10) cr ex with 5d×4 cr ex linked, Range 10/950, Wt. 22/9, ST 9†, Bulk -7, Cost $2,500. It disassembled into two loads: 4.5 lbs. and 8.5 lbs. Instead of batteries, it used a magneto generator – a squeezer operated by the gunner – for ignition. An improved projectile had Range 10/1,300, Wt. 20.5/7.5. It's still made in Brazil.

HASAG Panzerfaust 30, 44mm (Germany, 1943-1944)

Late in WWII, the German infantry's principal LAW was the *Panzerfaust* ("tank fist"), a 150mm over-caliber warhead launched from a 44mm tube using the recoilless principle. It was so light and simple that it was issued not to a special crew but to *any* soldier who might face a tank. There were several models, with different ranges and warheads; the most common was the Panzerfaust 30, with a 30-yard effective range. Six million were made. The weapon was exported to Axis countries, including Finland, Hungary, and Romania.

The Panzerfaust came preloaded (four per 50-lb. wooden box) and was discarded after use. The user needed three seconds to unfold the sights and prepare to fire. Backblast: 1d burn.

The *Panzerfaust 60* (1944-1945) had better range: Range 10/150, Wt. 13.4.

Firestone M18, 57×305mmR (USA 1945-1953)

This recoilless rifle entered service late in WWII; American airborne units used it in Europe and Japan. It was widely exported afterward, and went on to see action in the Korean and Vietnam Wars. It was also made in China.

The M18 could be fired from the shoulder, from its integral bipod and monopod (treat as a bipod; see p. B270), or from the 61-lb. tripod of the Browning M1917A1 ($2,700). It incorporated a 3× scope (+1 Acc). In addition to HEAT (in table), it could fire HE (Dmg 7d×3 cr with a 4d×2 [3d] cr ex follow-up, Range 800/5,000), WP (Dmg 7d×3(0.5) cr with a 1d+1 [1d(0.2)] burn ex follow-up, 14-yard-radius cloud lasting 1 minute, Range 750/4,600), and canister (Dmg 2d pi+, Acc 3+1, Range 50/1,100, RoF 1×154, Rcl 1). Four rounds in a box weighed 39 lbs. Backblast: 5d burn.

Backblast

Firing most LAWs and missiles creates a hazardous *backblast* behind the shooter: a discharge of hot gas and debris that can ignite flammables and reveal the firer's position. Backblast damage is given in the description of each weapon. It affects a 60° cone behind the launcher.

For *rockets* and *counterblast weapons,* damage is burning. Apply full damage out to two yards per die of backblast damage, half damage out to six yards per die.

For *countermass weapons,* damage is crushing. Range is only two yards per die.

In small, enclosed spaces, the walls, ground, etc., can reflect the blast back at the firer. Launches are only "safe" outdoors, or from within well-ventilated bunkers and buildings with ample clearance. These weapons are also extremely loud. Firing them indoors without hearing protection can stun the shooter (roll HT-4), and temporary Hard of Hearing is almost guaranteed.

Light Antitank Weapons Table

See pp. B268-271 for an explanation of the statistics.

GUNS (LAW) (DX-4 or most other Guns at -4)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
7	GE M1A1 Bazooka, 2.36" *linked*	4d×2(10) cr ex 5d×2 cr ex	0	10/700	16.1/3.4	1	1(4)	8†	-6	1	$1,800	1	[1, 2, 3]
7	HASAG Panzerfaust 30, 44mm *linked*	6d×3(10) cr ex 5d×5 cr ex	0	10/80	11.5	1	1	8†	-5	1	$400	1	[1, 2, 4]
7	Firestone M18, 57×305mmR *linked*	4d×2(10) cr ex 4d×2 cr ex	4+1	10/4,800	54/5.5	1	1(4)	11B†	-8	1	$2,000	1	[1, 2]
7	Carl Gustaf M2, 84×250mmR *linked*	6d×5(10) cr ex 6d×3 cr ex	4+1	10/1,100	38.9/5.7	1	1(4)	10†	-7	1	$2,000	1	[1, 2, 3]
7	KMZ RPG-2, 40mm *linked*	7d×2(10) cr ex 6d×2 cr ex	1	10/550	10.3/4	1	1(4)	9†	-6	1	$750	1	[1, 2]
7	KMZ RPG-7, 40mm *linked*	6d×4(10) cr ex 7d×2 cr ex	2+1	10/1,000	18.9/5	1	1(4)	9†	-7	1	$2,300	1	[1, 2]
7	HEC M72A2, 66mm *linked*	6d×3(10) cr ex 6d×2 cr ex	1	10/1,100	5.2	1	1	6†	-4	1	$500	1	[1, 2, 3]
8	MBB Armbrust, 67mm *linked*	6d×4(10) cr ex 6d×2 cr ex	1	10/1,500	13.9	1	1	8†	-5	1	$1,000	1	[1, 2, 3]
8	KBP RPO-A, 93mm	6d×9 cr ex	2	20/1,100	24.2	1	1	9†	-6	1	$3,600	1	[1, 2, 3, 5]
8	FFV AT4, 84mm *linked*	6d×6(10) cr ex 7d×2 cr ex	2	10/2,300	14.7	1	1	8†	-5	1	$1,600	1	[1, 2, 3]
8	Dynamit-Nobel PZF3, 60mm *linked*	6d×9(10) cr ex 6d×4 cr ex	2+1	20/1,200	28.4/23.3	1	1(4)	10†	-7	1	$7,200	1	[1, 2, 3]

Notes:

[1] Hazardous backblast (see description).

[2] First Range figure is *minimum* range, not 1/2D.

[3] Sling swivels (p. 154).

[4] Unreliable. Malfunctions on 16+ (see p. B407).

[5] Thermobaric. Divide damage by (2 × distance in yards from center of blast).

Carl Gustaf M2, 84×250mmR (Sweden, 1948-1991)

This shoulder-fired recoilless rifle was made by the Swedish Carl Gustaf arsenal. It saw worldwide use. Most Commonwealth and NATO armies adopted it, and it was produced under license in Germany, India, and Japan.

The M2 included a 2-lb. 2× scope (+1 Acc). It fired HEAT (in table), HE (Dmg 6d×2 cr with a 6d×5 [4d+1] cr ex follow-up), illumination (285-yard radius lasting 30 seconds), and smoke (Dmg 6d×2(0.5) cr with a 2d+1 cr ex follow-up, 10-yard-radius cloud lasting 10 seconds, Range 450/1,400). Backblast: 4d burn.

The FFV *M3* (1986-) is a lightened version firing a heavier round: Wt. 26.4/6.6, ST 9†, Cost $2,600. The U.S. Army Rangers adopted it in 1990; the U.S. Navy SEALs, in 1997. It includes a 1.5-lb. 3× scope (+1 Acc). In 1998, a 4.8-lb. mini-computer sight with 3.5× magnification and a 1,650-yard laser rangefinder became available (+1 Acc scope, +3 Acc rangefinder, +1 Guns, 6×VS/1,000 rangings). The M3 fires improved HEAT (Dmg 6d×6(10) cr ex with 5d×2 cr ex linked), HEDP (Dmg 6d×4(10) cr ex with 6d×3 [4d+1] cr ex linked), and, from 2002, MF (Dmg 1d-2 pi-, Acc 3+1, Range 100/1,200, RoF 1×1,100, Rcl 1).

KMZ RPG-2, 40mm (Russia, 1949-1962)

The *Reaktivniy Protivotankoviy Granatomyot-2* ("rocket antitank grenade launcher") was an improved Panzerfaust (p. 147) with better sights and ergonomics. The basic Communist antitank weapon until the 1960s, it was widely exported. The Vietnamese called it *Bazooka 40 Ly,* whence its nickname "B-40" among U.S. soldiers. China made it under license.

The RPG-2 fired an 82mm over-caliber HEAT warhead. Rocket and warhead had to be assembled before firing (three Ready maneuvers). A HEAT round costs $80. Backblast: 1d+2 burn.

KMZ RPG-7, 40mm (Russia, 1962-)

Since its introduction, this improved version of the RPG-2 (above) has seen extensive use by Communist forces as an antitank and antibunker weapon. At least nine million have been made worldwide, including in Belarus, Bulgaria, China, Egypt, Georgia, Iran, Iraq, North Korea, Pakistan, Romania, Ukraine, and Zimbabwe. Soldiers who faced it in Vietnam, Afghanistan, Angola, Somalia, Chechnya, or Iraq called it simply the "Arr-Pee-Gee" and disliked it intensely. Guerrilla movements everywhere seem to have an infinite supply of them, and fire them at anything – including trucks, helicopters, and bunkers. Armed robbers have used RPG-7s to attack armored money transports.

The RPG-7 usually mounts a 1.1-lb.battery-illuminated 2.7× scope (+1 Acc and removes -1 from darkness penalties, XS/10 hrs.); a 2-lb. 4× night sight (+2 Acc and Night Vision 6, XS/10 hrs.) can replace this. Rocket and warhead must be assembled before firing (three Ready maneuvers). In addition to the original 85mm HEAT grenade (in table) and 40mm HE grenade (Dmg 5d×2 [2d] cr ex), several more-modern rounds appeared in the 1990s, including 93mm HEAT (Dmg 6d×8(10) cr ex with 6d×3 cr ex linked, Wt.

19.6/5.7), 105mm MS-HEAT (Dmg 6d×2(10) cr ex with a 6d×7(10) cr ex follow-up and 6d×3 cr ex linked, Wt. 23.8/9.9), and 93mm thermobaric (Dmg 6d×9 cr ex, Range 20/750, Wt. 24.2/10.3). A HEAT round costs $150; three come in an 18.7-lb. rucksack. Backblast: 1d+2 burn.

HEC M72A2 LAW, 66mm (USA, 1963-1974)

The M72A2 LAW was a disposable rocket launcher that fired a HEAT warhead. Originally made for the U.S. military, it was issued liberally even at squad level. It was widely exported, and produced under license in Norway and Turkey. At least seven million were made.

Collapsed, the M72 was only 2' long (Holdout -3). The operator needed three seconds to extend the tube and unfold the sights. Backblast: 1d+2 burn.

All variants up to the *M72A3* (1974-) have similar performance. The *M72A4* (1993-) has improved penetration: Dmg 6d×5(10) cr ex with 6d×2 cr ex linked, Wt. 5.5, Cost $1,750. The *M72A6* (1993-) and *M72A7* (1997-) have HEDP warheads: Dmg 6d×2(10) cr ex with 6d×2 [3d+1] cr ex linked, Wt. 7.6, Cost $2,200.

The Russian 64mm Bazalt *RPG-18* (1971-) is a copy of the M72A2: Dmg 6d×5(10) cr ex with 6d×2 cr ex linked, Wt. 5.9, Cost $500.

MBB Armbrust, 67mm (Germany, 1979-1988)

The *Armbrust* ("crossbow") was a disposable LAW that fired a HEAT warhead. MBB designed it, but PRB actually manufactured it for that company, in Belgium. Singapore produced it under license. It saw use during the Yugoslavian Civil War.

The Armbrust had *almost* no hazardous backblast. The countermass consisted of plastic flakes, allowing the weapon to be fired from enclosures with a wall as close as one yard behind. The captive-piston arrangement trapped sound, flash, and smoke (apply the rules for *Silent Ammunition,* p. 165, but use the 256-yard line on the *Hearing Distance Table,* p. 158). Backblast: 1d+1 cr.

KBP RPO-A Shmel, 93mm (Russia, 1988-)

The *Reaktivnyi Pekhotnyi Ognemet-A* ("rocket-propelled infantry flamethrower") or *Shmel* ("bumblebee") is a disposable rocket launcher that fires a thermobaric warhead. The Soviet infantry adopted it in 1988 and used it in Afghanistan and Chechnya. Full production didn't begin until 2001, however. The weapon was exported to China, Congo, and India.

Each RPO-A has a padded shoulder strap, and two launchers can be clipped together to make a backpack. The weapon takes 30 seconds to prepare for firing. Backblast: 3d burn.

The *RPO-Z* (1988-) is the same launcher firing a WP rocket: Dmg 6d [1d(0.2)] burn ex.

FFV AT4, 84mm (Sweden, 1985-1996)

The AT4 ("eighty-four") is a disposable rocket launcher that fires a HEAT warhead. It has been widely exported, and from 1987 superseded the M72-series (see left) with the U.S. Army (which calls it the M136). A wooden box holding five weighs 113 lbs. Backblast: 4d burn.

The Bofors *AT4CS* (1996-) is a variant that can be safely fired from within such confined spaces as bunkers: Wt. 16.5, Cost $2,700. Its countermass consists of water and antifreeze. Backblast: 2d cr.

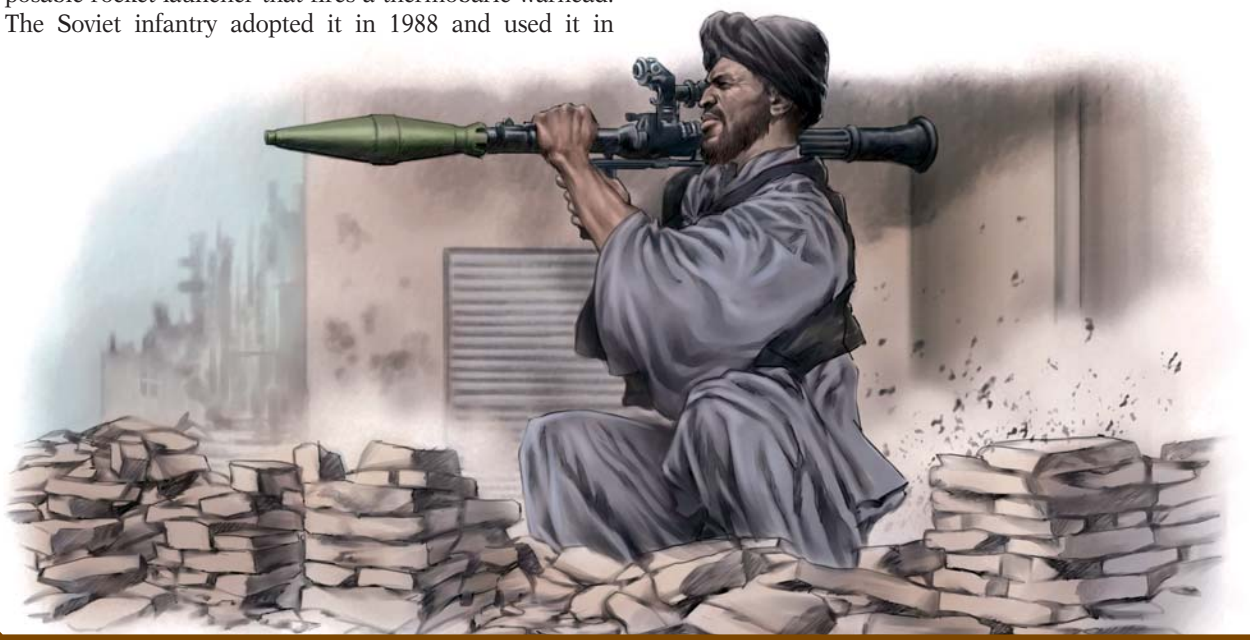
Dynamit-Nobel PZF3, 60mm (Germany, 1990-)

The *Panzerfaust 3* is a modern reloadable LAW. More than 250,000 have been made, some in Switzerland. Users include Germany, Italy, Japan, and South Korea.

The PZF3 mounts a 1.5-lb. 2.5× scope (+1 Acc). In 1998, a 4.8-lb. mini-computer sight with 3.5× magnification and a 1,650-yard laser rangefinder became available (+1 Acc scope, +3 Acc rangefinder, +1 Guns, 6×VS/1,000 rangings). A 2.6-lb. add-on night sight (Night Vision 7, 2×S/30 hrs.) can augment either scope or computer sight.

The PZF3 fires a 110mm over-caliber HEAT warhead. The round comes in a disposable launching tube, to which the reusable firing unit (5.1 lbs., including scope) is attached. A loaded tube weighs 27.7 lbs. with transport protection, 23.3 lbs. when stripped down to fire. A HEAT round costs $500. A 110mm MS-HEAT projectile is also available (Dmg 6d×4(10) cr ex with a 6d×9(10) cr ex follow-up and 6d×4 cr ex linked, Range 10/1,000, Wt. 29.3/24.2).

The PZF3 uses powdered iron as countermass, reducing the danger area behind the weapon. The shooter can fire it safely indoors. Backblast: 2d cr.



Vehicular Rocket Launchers

At TL3-4, unguided rockets are employed for artillery bombardment, launched from carts and ships. With refinements, rockets remain in use at TL5-8. They arm ground vehicles, naval vessels, and (at TL6+) aircraft.

Hale 9-pr Mk I, 2.5" (U.K., 1867-1899)

In 1844, William Hale invented a rocket that relied on spinning propulsion for stability, dispensing with the guidance stick of earlier designs. The Hale rocket was widely used in colonial wars. The 9-pounder version was popular, as it was light enough for pack animals to carry and a viable weapon in swamps and jungles where even light mountain guns were of no use. It was launched from a "rocket machine" – a trough on a tripod – in land service, or from shipboard tubes in naval service.

A mule could carry two packs of six rockets. Rockets, metal-lined wooden cases, and harness weighed 202 lbs. The disassembled trough and associated carrying equipment added 32 lbs. A HE rocket costs $55.

BM-13-16 Katyusha, 132mm (Russia, 1941-1945)

The BM-13-16 – better known as the *Katyusha* ("little Katie") and dubbed *Stalinorgel* ("Stalin's organ") by German troops under its bombardment – was one of the first multiple rocket launchers in military service. The 16-shot launcher fired the M-13 artillery rocket. Intended primarily for Soviet trucks (p. 239), it saw some use on tanks and naval vessels as well. It was short on range and accuracy, but put down a huge amount of explosive. A HE rocket costs $100.

M10, 4.5" (USA, 1943-1945)

The M10 was a light, three-shot rocket pod designed to fire the 4.5" M8 aircraft rocket from U.S. Air Force fighters (p. 238). Multiple rocket launchers installed on ground vehicles also launched this rocket. A HE rocket costs $200.

M260, 70mm Hydra (USA, 1979-)

This is a light, seven-shot rocket pod designed to launch the 70mm (2.75") MK 66 Folding-Fin Aerial Rocket (FFAR) from U.S. Army helicopters (p. 241). Other U.S. services – and export customers – adopted similar launchers to arm ground-attack aircraft. In addition to HE (in table), warheads include heavyweight HE (Dmg 6d×5 [3d+2] cr ex), HEDP (Dmg 6d×3(10) cr ex with 5d×4 [3d+2] cr ex linked), WP (Dmg 5d [1d(0.2)] burn ex, 19-yard-radius cloud lasting 5 minutes, Range 70/3,300), and beehive (Dmg 2d+2 cut, Range 450/7,000, RoF 7×1,179, Rcl 1). In 1993, the latter was adopted for use from special-ops helicopter gunships (p. 241). A HE rocket costs $1,300.

From 2006, Hydra rockets are available with a laser guidance package (see *Semi-Active Homing Weapons*, p. B412): Acc 4, Range 300/10,500, Cost $3,900.

The *M158* (1965-1979), used during the Vietnam War, fired the 2.75" MK 4 FFAR rocket: Dmg 7d×3 [3d+2] cr ex, Range 70/6,500, EWt. 40/21.

Guided and Homing Missiles

Guided missiles receive steering commands in flight. They appear at early TL7, and improve rapidly in the areas of guidance, propulsion, and warhead design. The first guided missiles were steered by an operator using a joystick, but by late TL7, most missiles merely require him to keep the launcher's sights trained on the target while the system's electronics do the rest. Wire, TV, and radio guidance – the most popular options – appear at roughly the same time, and each has its advantages and disadvantages. The most common application of these technologies is the antitank guided missile (ATGM), developed in the 1940s to arm infantry and light vehicles with a weapon capable of defeating tanks at long ranges. (An ATGM would likely be effective against dragons and other thick-skinned monsters, too!)

Homing missiles actually seek the target with little or no operator involvement. These, too, are an early TL7 development. The most popular systems are IR-, radar-, and imaging IR-homing designs, and semi-active laser- and radar-homing weapons. Such missiles first see use against aircraft.

Attacks with guided and homing missiles alike require the Artillery (Guided Missile) skill and use different rules from other ranged attacks; see *Guided and Homing Weapons* (pp. B412-413). Briefly, the first Range figure is

Vehicular Rocket Launchers Table

See pp. B268-271 for an explanation of the statistics. Empty Weight (EWt.) and Cost exclude ammo; the weight of *one* rocket follows the slash.

GUNNER (ROCKETS) (DX-4 or other Gunner at -4)

TL	Weapon	Damage	Acc	Range	EWt.	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
5	Hale 9-pr Mk I, 2.5"	6d×2 [3d] cr ex	0	200/3,400	27/8.4	1	1(5)	13M	-8	1	$200	1	[1, 2]
6	BM-13-16, 132mm	6d×3 [6d+2] cr ex	1	500/9,400	3,150/92	2	16(60i)	44M	-13	1	$10,000	1	[1]
7	M10, 4.5"	5d×5 [6d-1] cr ex	1	300/4,000	82/38	3	3(10i)	20M	-11	1	$1,800	1	[1]
8	M260, 70mm	7d×3 [3d+2] cr ex	2	70/10,500	35/23	7	7(10i)	22M	-9	1	$4,200	1	[1]

Notes:

[1] First Range figure is *minimum* range, not 1/2D.

[2] Unreliable. Malfunctions on 16+ (see p. B407).

the missile's *speed* in yards/second – not its 1/2D range. The weapon moves this far each turn; thus, it can hit a target at this range on the turn it's launched, but requires multiple turns to reach a more distant target. Don't make the attack roll until the turn the missile reaches its target. The projectile closes at its listed speed until it reaches the target or travels a total distance equal to its Max range (that is, after Max/speed seconds, including the turn of firing). At Max range, it crashes or self-destructs.

Most missiles have a hazardous backblast; see *Backblast* (p. 147).

Aérospatiale SS.11, 164mm (France, 1956-1980)

This French design was the first successful wire-guided HEAT missile. Widely adopted, the SS.11 was manufactured under license in Germany, India, and the U.S. Some 180,000 were made. The weapon was one of the first antitank missiles to be fired from a helicopter: the French used it in the Algerian War; the U.S. Army adopted it as the AGM-22 and used it from the UH-1B "Huey" in Vietnam; and the British deployed it in the 1982 Falklands War. Air-launched versions were usually designated AS.11 (AS means *air-sol* or air-to-surface, while SS means *sol-sol* or surface-to-surface).

One SS.11 in its carrying case weighed 110 lbs. The case's lid doubled as a launcher. Backblast: 6d burn.

Kolomna 9M14M Malyutka-M, 125mm (Russia, 1964-1985)

Known in the West as the "AT-3b Sagger," the *Malyutka* ("baby") is the world's most widespread wire-guided antitank missile, adopted by more than 45 armies. It's a good weapon, but its long flight time makes it easier to avoid than later missiles. The basic design has remained in production into the 21st century due to its low cost and the ease of upgrading the guidance system and warhead. Licensed and unlicensed copies have been made in Bulgaria, China, Czechoslovakia, Iran, Romania, Taiwan, and Yugoslavia.

The missile comes in a buoyant fiberglass case (15 lbs.) that one man can lug to a forward firing position – an arrangement that led to the weapon being dubbed the "suitcase missile" during the Yom Kippur War (1973). Before firing, the HEAT warhead and rocket motor must be joined, the missile inserted into the launching rail on the lid, and the 8× sight and control stick deployed (takes 100 seconds). Backblast: 4d burn.

The original *9M14 Malyutka* (1963-1968), or "AT-3a Sagger," had a less-powerful warhead: Dmg 6d×5(10) cr ex with 6d×5 cr ex linked.

The upgraded *9M14P Malyutka-P* (1968-1995), or "AT-3c Sagger," added improved semiautomatic guidance (Acc 3+3) and was intended for vehicular installation, such as on the BMP-1 infantry fighting vehicle.

The *9M14P2 Malyutka-2M* (1996-), or "AT-3d Sagger," adds an MS-HEAT warhead and improved motor: Dmg 6d×2(10) cr ex with a 6d×9(10) cr ex follow-up and 7d×5 cr ex linked, Acc 3+3, Range 135/3,300, Wt. 15/29.

Hughes BGM-71A TOW, 127mm (USA, 1970-1976)

The BGM-71 TOW series – a wire-guided missile with a HEAT warhead – is the West's most common heavy antitank missile system. It has been sold to some 40 countries, and Pakistan and Switzerland manufacture it under license. Improved versions quickly superseded the original BGM-71A, and over 620,000 missiles of various models have been made. The TOW had an impressive kill rate when first used in combat in Vietnam, and this was confirmed in the 1991 and 2003 Gulf Wars.

TOW stands for "Tube-launched, Optically tracked, Wire-guided," which sums up the weapon's operation rather well. The missile is fired from the M220 tripod launcher. It arms a variety of vehicles, including jeeps (pp. 236-237), HMMWVs (pp. 252-243), and helicopters (pp. 240-241).

The M220 launcher weighs 172 lbs. with tripod or 151 lbs. without (as when mounted on a vehicle). It's powered by a 24-lb. set of batteries (2×L/50 firings) and includes a 13× sight (+3 Acc). A 20-lb. add-on thermal-imaging sight (Infravision, L/2 hrs.) became available in 1974. A missile costs $14,000. Backblast: 8d burn.

The *BGM-71D TOW 2* (1982-1987) had an improved 152mm HEAT warhead: Dmg 6d×12(10) cr ex with 8d×5 cr ex linked, Range 360/4,165, Wt. 172/62. Over 77,000 were made. A missile costs $25,000.

The *BGM-71F TOW 2B* (1992-) attacks from overhead (see p. B415), flying over the target and firing two 147mm EFP warheads *down* into the more lightly armored top, each doing 6d×4(2) pi++: Range 336/4,165, Wt. 172/64. Minimum range is 165. By 2005, over 37,000 had been made. A missile costs $50,000.

The *BGM-71H TOW 2 Bunker Buster* (2004-) has a HE warhead: Dmg 6d×9 [7d+2] cr ex, Range 336/4,165, Wt. 172/64. Minimum range is 165. A missile costs $10,000.

Euromissile MILAN, 103mm (France/Germany, 1974-1984)

The *Missile d'Infanterie Léger Anti-char* ("light antitank infantry missile") is a (barely) man-portable, wire-guided missile with a HEAT warhead. In addition to developers France and Germany, 40 other countries operate it, including Iraq and Mexico. More than 10,000 launchers and 340,000 missiles were sold, and India, Italy, and the U.K. made the weapon under license. The British used it extensively to knock out bunkers in the Falklands and Iraq, which was expensive but effective.

The 36-lb. launching post includes a 7× sight (+2 Acc). A 17.4-lb. add-on thermal-imaging sight (Infravision, L/2 hrs.) became available in 1983. A missile costs $25,000. Backblast: 2d burn.

The *MILAN 2* (1984-) has a 115mm HEAT warhead: Dmg 6d×12(10) cr ex with 7d×4 cr ex linked. A missile costs $30,000.

The *MILAN 3* (1996-) has a 117mm MS-HEAT warhead (p. 170) with a 30mm precursor that penetrates explosive reactive armor: Dmg 7d×2(10) cr ex with a 6d×11(10) cr ex follow-up and 7d×4 cr ex linked, Wt. 37.2/28. A missile costs $35,000.

McDonnell FGM-77A Dragon, 127mm (USA, 1975-1981)

The FGM-77A Dragon was a man-portable, wire-guided missile with a HEAT warhead, fired from the M47 launcher. The U.S. issued it as its standard guided anti-tank weapon for small infantry units until the late 1990s. A disappointing weapon with less performance than contemporary competitors, it was nevertheless widely exported. Some 200,000 were made.

The M47 consisted of a disposable transport/launch tube with a bipod and a reusable 6.8-lb. command launch unit (CLU) with 6× magnification (+2 Acc). For night use, there was a 21.7-lb. CLU with 4× magnification and thermal imaging (+2 Acc and Infravision, M/2 hrs.). A missile costs $3,000. Backblast: 3d burn.

Ford AIM-9L Sidewinder, 127mm (USA, 1978-1982)

The AIM-9L Sidewinder was an IR-homing air-to-air missile with an ABF warhead (p. 174). Originally introduced by the U.S. Air Force, it was probably the most successful weapon of its kind. Some 16,000 were made in the U.S. alone. It was also produced in Germany and Japan, and widely exported.

The original Philco *AIM-9B Sidewinder* (1956-1962) was less effective, featuring a HE warhead and an early homing system: Dmg 6d×8 [6d+1] cr ex, Acc 2, Range 632/3,800, Wt. 155. More than 95,000 were made, some in Germany. A missile costs $35,000.

The Raytheon *AIM-9X Sidewinder* (2003-) is the latest version: Acc 5, Range 950/45,000, Wt. 188. A missile costs $75,000.

The Ford *MIM-72C Chaparral* (1978-1981) was a version for surface-to-air use, typically mounted on the tracked M48A1 Chaparral air-defense vehicle. Some 21,000 missiles were made. Use the AIM-9L stats.

The Vympel *R-3S* (1962-1973), NATO designation "AA-2a Atoll," was a Russian copy of the Sidewinder: Dmg 6d×8 [6d+1] cr ex, Acc 4, Range 900/8,400, Wt. 166. It was in turn copied in China and Romania. A missile costs $25,000.

In all cases, backblast is 5d×2 burn.

GD FIM-92A Stinger, 70mm (USA, 1981-1987)

The FIM-92A Stinger was a man-portable, IR-homing surface-to-air missile with a HE-AB warhead (pp. 174-175). Some 15,600 were made, and over 20 nations adopted it. The Stinger first saw action with the SAS during the Falklands War. From 1986, Afghan guerrillas used it against the Soviets. In the 1990s, the CIA unsuccessfully tried to buy back the remaining Afghan-held weapons.

The Stinger consists of a 29.2-lb. disposable launch tube containing the missile, attached to a reusable 4.4-lb. gripstock that accepts a 0.9-lb. "battery coolant unit" (BCU).

Guided and Homing Missiles Table

See pp. B268-271 for an explanation of the statistics. In all cases, first Range figure is *speed* in yards per second, not 1/2D. Weight is the launcher's empty weight, with missile weight appearing after the slash, except as noted. Cost is *launcher* cost, unless noted otherwise; see weapon description for *missile* cost.

ARTILLERY (GUIDED MISSILE) (IQ-5)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Cost	LC	Notes
7	Aérospatiale SS.11, 164mm *linked*	6d×8(10) cr ex 6d×6 cr ex	1+3	165/3,300	44/66	1	1(20)	17M	$10,000	1	[1, 2, 3, 4]
7	Kolomna 9M14M Malyutka-M, 125mm *linked*	6d×7(10) cr ex 7d×5 cr ex	1+3	130/3,300	15/25	1	1(20)	13M	$8,000	1	[1, 2, 3, 4]
7	Hughes BGM-71A TOW, 127mm *linked*	6d×8(10) cr ex 7d×5 cr ex	3+3	330/3,300	172/54	1	1(20)	21M	$180,000	1	[1, 2, 3]
7	Euromissile MILAN, 103mm *linked*	6d×8(10) cr ex 6d×4 cr ex	3+2	220/2,200	36/26.4	1	1(20)	16M	$100,000	1	[1, 2, 3]
7	McDonnell FGM-77A Dragon, 127mm *linked*	6d×8(10) cr ex 7d×4 cr ex	3+2	220/1,100	6.8/25	1	1(20)	10B†	$16,000	1	[1, 2, 3]
7	Ford AIM-9L Sidewinder, 127mm	6d+1 pi	4	900/32,000	188	1×194	1(20)	22M	$50,000	1	[1, 2, 4, 5, 6, 7]
8	GD FIM-92A Stinger, 70mm	6d×3 [3d+2] cr ex	4	800/8,800	5.3/29.2	1	1(10)	10†	$40,000	1	[1, 2, 5]
8	RLM FGM-148A Javelin, 127mm *follow-up* *linked*	6d×3(10) cr ex 6d×11(10) cr ex 7d×4 cr ex	6	220/2,200	14.1/35.1	1	1(10)	11B†	$135,000	1	[1, 2, 5]

Notes:

[1] Missile has a *minimum* range: 30 for MILAN; 70 for TOW, Dragon, and Javelin (direct attack); 165 for Javelin (top attack); 220 for Stinger; 550 for SS.11 and 9M14M; 1,100 for Sidewinder.

[2] Hazardous backblast (see description).

[3] Guided attack (see p. B412). Gunner uses Artillery (Guided Missile) to *attack*.

[4] Cost is for disposable carrying-case/launcher *including* one missile (SS.11, 9M14M), or for one ready-to-launch missile (Sidewinder).

[5] Homing attack (see p. B413). Gunner uses Artillery (Guided Missile) to *aim*.

[6] ABF warhead (p. 174) – a multiple-projectile attack with Rcl 1.

[7] Vehicle-launched; weight is for *missile only*.

For night use, a 5.1-lb. add-on sight with 12× magnification and thermal imaging (+3 Vision and Infravision, M/6 hrs.) is available. Attaching a new BCU and launch tube to the grip takes 10 seconds. A missile costs $40,000.

Before launch, the gunner inserts the BCU into the grip and turns on the 5.7-lb. IFF system (p. 229) on his belt. After he visually acquires his target, the IFF system interrogates it, if it's within 20 miles; it takes one second to get an IFF response. The operator then activates the BCU (which provides 45 seconds of power) to cool the seeker head. This requires at least six seconds, during which time the user can attempt to track and lock onto the target. Lock-on allows the shooter to pull the trigger and activate the missile, which launches two seconds later. Backblast: 4d burn.

The *FIM-92C Stinger* (1987-) has an improved seeker (Acc 5). It's the most common variant, and is also licensed to Germany. About 60,000 have been made. A missile costs $45,000.

RLM FGM-148A Javelin, 127mm (USA, 1996-)

The FGM-148A Javelin is a man-portable, imaging IR-homing missile, fired from the M98A1 launcher. Its 127mm MS-HEAT warhead (p. 170) has an 80mm precursor that penetrates explosive reactive armor. The Javelin replaces the obsolete Dragon (p. 152) in U.S. service, and is also exported.

The missile comes in a disposable container/launching tube, to which the 14.1-lb. command launch unit (CLU) is attached. This includes a 4× sight (+2 Vision) and a 9.2× thermal imager (+3 Vision and Infravision, M/4 hrs.) to acquire the target. The shooter can select whether the missile attacks normally or flies in a ballistic curve and strikes from *above.* The direct-attack mode can be used against slow, low-flying aircraft and helicopters, as the Javelin's IR seeker will lock onto any motor vehicle. The top-attack feature (see p. B415) lets the weapon hit tanks where their armor is thinnest. A missile costs $85,000. Backblast: 3d burn.

Firearm Accessories

Shooters love gizmos! Below are *dozens* of accompaniments and add-ons for guns. Should statistics for such a device appear in a firearm description, they take precedence over these generic rules. The GM may make similar gadgets available for crossbows, liquid projectors, etc., where logical.

Holsters, Scabbards, and Slings

Before the 1850s (mid-TL5), holsters were an item of horse furniture, not of human dress – cavalrymen slung a pair across the saddle pommel. Handguns were typically carried in a pocket or thrust through the belt. Large pistols, notably those issued by England's Royal Navy and carried by Highland infantry, had flat spring hooks on one side to hold them in the belt. For a romp on Saturday night, cowboys tucked their Colt revolvers under their shirt, with the loading gate open; this prevented the gun from slipping any lower and facilitated a fast draw, if needed. Small pistols fit neatly in the side or tail pocket of a gentleman's coat, or in a lady's muff. They could even be tucked into the crown of a hat – a courtly doffing of the hat might be an assassin drawing his weapon!

Holsters and scabbards protect firearms from the elements, help get them into action more quickly, and prevent them from being dropped or lost. Each model of gun requires its own specific holster or scabbard. Similar weapons *may* fit, at the GM's discretion.

Getting a pistol into or out of a holster takes one Ready maneuver. A successful Fast-Draw (Pistol) roll lets you draw a handgun as a free action; see *Fast-Draw* (p. 81). The Quick-Sheathe perk (p. 252) allows you to holster a weapon the same way.

Unslinging or slinging a long arm takes *two* Ready maneuvers – or three, if the slung position is on the back. For unslinging, a successful Fast-Draw (Long Arm) roll reduces these times by a second. The Quick-Sheathe perk extends the benefits of Fast-Draw to slinging a weapon.

For those trying to maintain a low profile while packing heat, holster design and placement can greatly affect the Holdout skill. The best hiding places are the hardest to reach. A gunman must choose between getting to his gun quickly and keeping it out of sight.

> *He pulled his rifle from its scabbard, levered a cartridge into the chamber, and held the gun across the pommel of his saddle.*
>
> *– John Steinbeck,* ***The Long Valley***

Belt Holster (TL5)

This is the standard hip holster worn by cowpokes, soldiers, and cops from the mid-1800s to present. On early versions, a leather loop around the hammer keeps the weapon from falling out. It takes a Ready maneuver to remove this and enable use of Fast-Draw (Pistol). From the 1920s, a thumb-break strap – so-called because the gunman thumbs open the closed strap as he draws – serves the same purpose but is *always* ready for a speedy draw. $25, 0.5 lb. LC4.

Lanyard (TL5)

A lanyard is a cord running from a weapon to the belt or neck. It lets a gunman retrieve a dropped gun on a DX roll. Each attempt requires a Ready maneuver. Most firearms used with Guns (Pistol), but few others, have a ring for attaching a lanyard; see the weapon tables for exceptions. A lanyard can be cut: -6 to hit, DR 2, HP 2. $1, neg. LC4.

Military Holster (TL5)

Military holsters often have a flap designed to keep dust, mud, and crud off a handgun; the pistol isn't "exposed" for the purpose of *Slime, Sand, and Equipment Failure* (p. B485) and may avoid the Malf. penalty for harsh environments noted in *Cleaning and Maintenance* (p. 80). Such holsters are *slow,* however. The flap can be opened and tucked behind the belt to avoid the Fast-Draw penalty, but then it provides no protection. Holsters like this often have built-in magazine or cartridge pouches. -2 Fast-Draw (Pistol). $50, 2 lbs. LC4.

Rifle Sling (TL5)

A sling allows a gunman to use both hands while keeping his shoulder arm close. It also lets him brace even when he has nothing to prop his gun on, giving an extra +1 when aiming; see *Aim* (p. B364). Bracing with a sling is a two-handed task that takes one Ready maneuver per -1 Bulk; e.g., five seconds at Bulk -5. Leaving this position, thereby freeing the hands, requires a Ready maneuver. Most firearms used with Guns (LMG, Rifle, Shotgun, or SMG), but few others, have swivels for fastening a sling; see the weapon tables for exceptions. $10, 1 lb. LC4.

Scabbard (TL5)

This is a sheath or a covering for a carbine, shotgun, or other shoulder arm. A scabbard is a common accessory among those who ride animals, motorcycles, and open-topped vehicles (for examples, see *WWII Jeep,* pp. 236-237). It protects a long arm in the same way that a military holster (see above) protects a handgun. $25, 1 lb. LC4.

Shoulder Holster (TL5)

A shoulder holster is worn on the off-hand side, usually under the armpit. Some models carry the gun horizontally; others hold it vertically, barrel-down or (rarely) barrel-up. Most have provision for speedloaders, magazines, or handcuffs under the opposite armpit. This is more comfortable, as it helps balance the rig. Shoulder holsters are a common choice for private eyes, police detectives, aviators, and AFV crew. -1 Fast-Draw (Pistol). $50, 1 lb. LC4.

Sleeve Holster (TL6)

This is a spring-loaded holster strapped to the forearm in the tradition of James West in *The Wild, Wild West* or Travis Bickle in *Taxi Driver.* The wearer activates it via a lever near the elbow, typically by pressing the elbow against the body. This requires a Fast-Draw (Pistol) roll. Success causes a slim metal bar thrust forward, allowing the gunman to grasp the handgun (no larger than Bulk -1) mounted at the end. Failure means the device fails to work properly; getting the weapon requires use of the free hand and a further Ready maneuver. Critical failure indicates the device *breaks* – extracting the gun requires 2d seconds of prying and pulling with the free hand! -2 Holdout. $500, 0.5 lb. LC4.

Fast-Draw Rig (TL7)

A holster and belt can be custom-built for speed. The drop-hip belt with its low-slung, smooth-drawing, steel-lined holster is a 1950s Hollywood novelty; authentic Old West gunfighters never used it. Nevertheless, it *is* fast! +2 Fast-Draw (Pistol). $500, 3 lbs. LC4.

Patrol Sling (TL7)

This padded sling lets the wearer *safely* drop his long arm without pausing to stow it, immediately freeing both hands for another task. It's adjustable: at rest, the weapon hangs either horizontally, at waist level, or vertically, typically with its stock near the armpit and its barrel pointing down and behind the hip so that it doesn't hinder its owner as he runs. The gun can be fired without unslinging it. Raising it to a shooting position requires only one Ready maneuver; a successful Fast-Draw (Long Arm) roll makes this a free action. Most firearms used with Guns (LMG, Rifle, Shotgun, or SMG), but few others, have swivels for fastening a sling; see the weapon tables for exceptions. +1 Fast-Draw (Long Arm). $50, 2 lbs. LC4.

Undercover Holster (TL7)

Concealable holsters are padded, designed to soften the hard edges of a hidden handgun. Most are worn inside the pants, with a shirt over the top of the gun (Bulk -2 or worse), or on the ankle (Bulk -1 or 0 only). -1 Fast-Draw (Pistol), +1 Holdout. $125, 1 lb. LC4.

Retention Holster (TL8)

Modern hip holsters, especially those used by police, are sometimes designed to prevent an assailant from snatching the holstered sidearm. Without a specific twist or tilt, the pistol won't come out of such a holster, even if it's turned upside down. This makes it difficult for anyone but the wearer to draw the gun. The owner gets +2 to his Retain Weapon technique (p. B232) while his weapon is holstered. $100, 0.5 lb. LC4.

Magazine Modifications and Reloading Aids

Several innovations exist to increase ammo capacity and/or cut reloading time for cartridge-firing repeaters. For the costs and weights of *standard* magazines, spare cylinders, and so on, see the weapon tables and descriptions.

Extended Magazines (TL6)

Extending the length of a detachable magazine gives more ammunition capacity – typically 1.5× to 2× normal. Extended magazines are heavier, possibly unreliable (-1 Malf., at the GM's discretion), and often unwieldy (add -1 to weapon's Bulk if capacity is over 1.5× normal). Some even protrude downward far enough to make shooting while prone difficult or impossible.

Example: Replacing the 20-round magazine of an M16A1 rifle with a 30-round magazine doesn't change Bulk. Swapping the 17-round magazine of a Glock 17 pistol for a 31-rounder adds -1 Bulk.

Drum magazines (TL6) stow extra ammo more compactly than normal extended magazines; they're essentially extended magazines coiled to reduce length. Drums don't protrude any more than standard magazines, but they *do* worsen Bulk (add -1 to Bulk if capacity is above 3× normal). They're also heavy, expensive, and almost always less reliable (-1 Malf. or worse).

High-density magazines (TL7) are available for some weapons. These increase capacity without increasing magazine length, typically by stacking cartridges in several staggered rows. They're heavy, but don't affect Bulk. Some are unreliable (-1 Malf., at the GM's discretion). High-density magazines aren't an option for weapons that insert the magazine in the grip – like most pistols and some SMGs – unless part of the original design.

To find the weight of a *loaded* magazine, multiply weight per shot (WPS) from the *Ammunition Tables* (pp. 175-177) by the number of rounds it holds, and then by a fixed multiplier: 1.1 for a high-density alloy or plastic box; 1.2 for an extended alloy or plastic box; 1.3 for a high-density steel box, or an alloy or plastic helical drum; 1.5 for an extended steel box; 1.6 for a helical steel drum, or an alloy or plastic drum; or 2 for a steel drum.

Example: The M16 fires the .223 Remington round (WPS 0.026). An extended 50-round magazine made of aluminum alloy would weigh 0.026 × 50 × 1.2 = 1.56 lbs., rounded to 1.6 lbs.

To find the cost of an *empty* magazine, multiply WPS by five times the number of rounds it holds, and then add a fixed cost factor: $25 for an extended steel box; $27 for a high-density steel box; $30 for an extended alloy or plastic box; $33 for a high-density alloy or plastic box; $250 for a steel drum/helical drum; or $300 for an alloy or plastic drum/helical drum.

Example: The extended 50-round alloy magazine above would cost (0.026 × 5 × 50) + 30 = $36.50, empty.

These costs and weights are *generic.* Historical magazines often differ. See the weapon descriptions for many examples.

Normally, the gun's manufacturer produces extended magazines as accessories. Gunsmiths *can* make them, however. This requires two Armoury (Small Arms) rolls: one to design the magazine, one to build it. Note that in some real-world jurisdictions, high-capacity magazines render LC3-4 guns LC1-2.

Speedloaders (TL6)

A speedloader lets a gunman with a revolver insert all – or at least several – rounds into his weapon's cylinder simultaneously instead of reloading a cartridge at a time. This *dramatically* reduces reloading time; see *Reloading Your Gun* (p. 86). Speedloaders only work for revolvers that break or tip open, or those with swing-out cylinders; gate-loaders can't use them. One of the first models was the Prideaux speedloader for Webley revolvers, introduced in the 1880s. Speedloaders for swing-out revolvers weren't widely used until the 1960s. $10, 0.1 lb. LC4.

Clamped Magazines (TL8)

Magazines can be clamped side-by-side using a removable bracket ($20, 0.3 lb., LC4). Some plastic magazines have *integral* studs and brackets that let shooters clip as many magazines as desired alongside one another. Both developments are TL8, but taping magazines together with duct tape (p. 26) has been a popular field modification in every war since WWII. Any of these measures saves one Ready maneuver when reloading; see *Reloading Your Gun* (p. 86). Magazines not in use are prone to get dirt inside, and taped magazines, where one points down, often get damaged feeding lips; the GM may assess -1 Malf. in suitably harsh conditions.

Sights and Aiming Aids

Guns are often given targeting systems – sights, scopes, even computers. The combined bonus from all such gadgetry can't exceed the weapon's base Accuracy (but see *Precision Aiming,* p. 84). For instance, a telescopic sight that gives up to +4 Acc gives only +2 Acc on an Acc 2 pistol.

Telescopic Sights (TL5)

Telescopic sights, or "scopes," for firearms are a late-TL5 development that becomes common at TL6-8. A scope gives a bonus to hit *if* you take one or more Aim maneuvers: +1 Acc per full *doubling* of magnification. With a *fixed-power* scope, you must Aim for at least as many seconds as the bonus. With a *variable-power* scope, you may Aim for fewer seconds but this reduces the bonus by a like amount. Variables cost more and are somewhat more fragile. All scopes listed in this book are fixed-power unless noted otherwise.

Since they also collect light, all but the cheapest TL7-8 scopes remove -1 from darkness penalties. Some have an illuminated reticle (lit by battery, tritium, etc.) to aid aiming in low-light conditions; this cancels up to -2 in darkness penalties. For other notes, see *Optics* (p. 47) and *Scopes* (p. B412).

None of these benefits apply to *unaimed* shots. In fact, a high-powered scope (anything over 4×) makes unaimed shots slower: add -1 to Bulk.

Fixed-Power Scope (TL5). An early device, 3-4' long. Pick any magnification between 2× and 32×. $100 per +1 Acc, 3-4 lbs. LC4.

Fixed-Power Scope (TL6). Pick any magnification between 2× and 32×. $125 per +1 Acc, 1.5 lbs. LC4.

Fixed-Power Scope (TL7). Pick any magnification between 2× and 32×. $150 per +1 Acc, 1 lb. LC4.

Variable-Power Scope (TL7). Pick *three* magnifications between 1.5× and 32×, typically whole-numbered multiples. $200 per +1 Acc, 1.5 lbs. LC4.

Variable-Power Scope (TL8). Pick *three* magnifications between 1.5× and 32×, typically whole-numbered multiples. $250 per +1 Acc, 1 lb. LC4.

Example: A TL7 fixed-power 4× scope gives +2 Acc and costs $150 × 2 = $300. A TL8 variable-power scope with 3×, 6×, and 9× (written 3-9×) gives up to +3 Acc and costs $250 × 3 = $750.

Improved-Visibility Sights (TL6)

Making a gun's sights more visible reduces the difficulty of seeing them – and hence shooting – in the dark. Improved-visibility sights typically have three dots or lines of light-colored paint, or inserts of luminescent material (often tritium). This negates -1 in darkness penalties, but has no effect in normal light. (The GM may extend this benefit to such simple makeshift measures as a white handkerchief tied around the muzzle, common at lower TLs.) Improved-visibility sights appear as optional accessories for a few guns starting in mid-TL6, become integral fixtures on some late-TL7 firearms, and are either standard or available for nearly all TL8 weapons. $75, neg. LC4.

Collimating and Reflex Sights (TL7)

Invented in WWI – originally for aircraft use – these sights involve a lens onto which a bright red or yellow dot is projected, coinciding with the weapon's point of aim out to a certain range. In a *collimating sight* (often called a "red dot sight"), the lens is incorporated into a scope-like tube. In a *reflex sight,* the lens is mounted in a small frame (known as a "head-up display," or HUD, on aircraft).

Either type of sight improves situational awareness by allowing the shooter to keep both eyes open. Target acquisition is faster: instead of aligning fore and rear sights, the gunman simply superimposes the dot on his target. This gives +1 Guns skill at ranges up to 300 yards and makes it easier to aim in low-light conditions, negating up to -3 in darkness penalties on *all* shots. Both designs can be used with night-vision devices but not with magnifying scopes.

Note that the dot is visible only through the lens – the product of electronics or a tritium or battery illuminator. These sights don't project a visible dot *on* a distant target like a targeting laser (pp. 156-157) does. If you have a sight and a laser, you must choose to use one or the other – not both at once.

Collimating Sight, Battery (TL7). $250, 0.5 lb., XS/250 hrs. LC4.

Collimating Sight, Tritium (TL7). An unpowered tritium-illuminated version. $400, 0.5 lb. LC4.

Reflex Sight, Battery (TL8). $350, 0.25 lb., XS/500 hrs. LC4.

Reflex Sight, Tritium (TL8). $550, 0.25 lb. LC4.

Night Sights (TL7)

Image-intensifying night sights (also known as "light amplifiers" or "starlight scopes") electronically amplify ambient light. The higher the TL, the lighter and smaller they get. Some include magnification, and work like telescopic sights (pp. 155-156); others are add-ons, installed *in front of* scopes or collimating sights (above). In all cases, the shooter has Colorblindness (p. B127) and Tunnel Vision (p. B151) while using the sight. For other important details, see *Night-Vision Optics* (pp. 47-48).

Early Night Sight (TL7). Introduced in the 1940s, this huge device gives Night Vision 2. It's usually used with IR illumination (p. 47). It adds -2 Bulk. $1,000, 4 lbs., external power. LC3.

Night Sight (TL7). By the 1960s, a bulky but man-portable sight gives Night Vision 4 and +2 Acc. It adds -2 Bulk. $500, 5 lbs., 4×S/30 hrs. LC3.

Improved Night Sight (TL7). A 1970s-era system gives Night Vision 5 and +2 Acc. It adds only -1 Bulk. $1,500, 3.5 lbs., 2×XS/60 hrs. LC3.

Improved Night Sight, Add-On (TL7). This gadget adds Night Vision 5 to the benefits of another scope or sight. $1,000, 2.5 lbs., 2×XS/60 hrs. LC3.

Advanced Night Sight (TL8). From the 1980s, a typical night sight gives Night Vision 7 and +2 Acc. $2,500, 2 lbs., 2×XS/90 hrs. LC3.

Advanced Night Sight, Add-On (TL8). This accessory adds Night Vision 7 to the benefits of another scope or sight. $1,500, 1 lb., 2×XS/90 hrs. LC3.

Tactical Lights (TL7)

A powerful flashlight mounted on a firearm can illuminate the area immediately in front of the muzzle. Poachers at mid-TL6 jury-rig such things, but purpose-built tactical lights are a mid-TL7 development that only enters wide use at early TL8, with the appearance of halogen burners compact enough to mount under pistol and SMG barrels. See *Tactical Lights* (p. 52) for rules and statistics – small lights are usual for pistols, large ones for shoulder arms. When shooting at ranges within the listed beam length, either version lets the gunman use the more favorable of -3 or the actual darkness penalty (see *Visibility,* p. B394) and may momentarily blind the target. Such lights can also accept IR filters (see *Flashlights,* pp. 51-52).

Targeting Lasers (TL7)

Also called "laser sights" (p. B412), these devices are low-powered lasers that project an aiming dot onto the target. Early versions were bulky gadgets cobbled together by amateurs in the 1970s. Commercial versions were miniaturized

for sale in the 1980s. Models small enough to fit *inside* some pistols appeared in the 1990s.

If *you* can see your targeting laser's aiming dot, you get +1 to hit whether or not you took an Aim maneuver. If *your target* can see it, he gets +1 to Dodge – but the GM may require a Fright Check! Activating the laser is a free action; declare whether it's on before you Aim or Attack. Targeting lasers have a maximum effective range beyond which the dot is too dispersed to give a bonus, however. If no range is given, assume that it's matched to the 1/2D range of the weapon on which it's mounted.

Beam color, which depends on wavelength, modifies effective range in some situations. Red lasers are most common, and work well in low-light conditions but suffer as lighting improves (1/3 effective range in daylight). Orange lasers perform better in daylight (1/2 effective range). Green lasers have *twice* normal range in low light and normal range in daylight. Infrared (IR) lasers always get full range, but you need Night Vision, Infravision, or Hyperspectral Vision to see them. At TL7, red is the only option; at TL8, lasers can instead be orange (×1.25 cost), green (×4 cost), or IR (×1.5 cost). IR lasers are LC2.

Note that the laser *beam* – as opposed to the aiming dot – is generally invisible. In smoke, fog, and similar conditions, though, it's easily seen, betraying the shooter's position! Green beams are always visible, while IR ones are always invisible to those without special vision advantages.

A shooter can use a targeting laser simultaneously with a telescopic sight (pp. 155-156) but *not* with a collimating or reflex sight (p. 156). At TL8, a targeting laser and a tactical light (above) can be combined into one accessory; add costs but use only the heavier weight.

Primitive Targeting Laser (TL7). A large, first-generation device with a 200-yard range. Adds -1 to Bulk. $1,500, 5 lbs., M/2 hrs. LC3.

Targeting Laser (Sidearm) (TL8). A compact targeting laser with a 150-yard range. $150, 0.25 lb., 2×XS/50 hrs. LC3.

Targeting Laser (Shoulder Arm) (TL8). A compact targeting laser with a 750-yard range. $750, 0.5 lb., 2×XS/50 hrs. LC3.

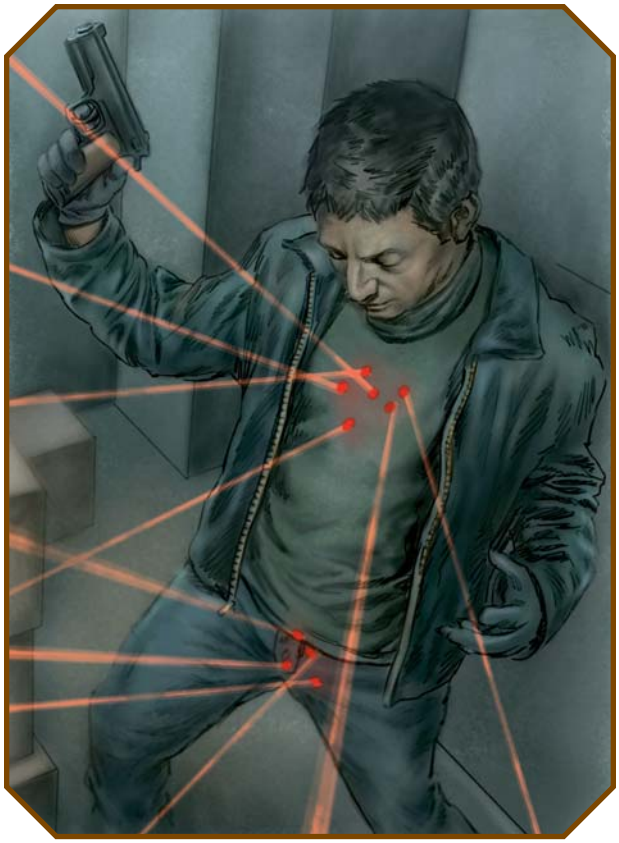
Integral Targeting Laser (Sidearm) (TL8). A miniature targeting laser with a 150-yard range, installed inside the grip sideplates or in place of the recoil spring rod. $450, neg., 4×T/2 hrs. LC3.

Integral Targeting Laser (Shoulder Arm) (TL8). A built-in targeting laser with a 750-yard range. $900, neg., 2×XS/100 hrs. LC3.

Computer Sights (TL8)

At TL8, full-solution fire-control systems with integral ballistic computers are introduced for infantry weapons. Initial platforms are rocket launchers and grenade launchers, which profit greatly from improved rangefinding and programming. As TL8 progresses, these sights grow small enough to mount on small arms.

Typical devices run a targeting program that gives +1 Gunner or Guns, include a laser rangefinder, and incorporate magnification (optical and/or electronic) and low-light capability (image intensification or thermal imaging). The



gunner lases the target, and the computer calculates the aiming point and shows it on an integral display. This provides an extra +3 to hit that target with an *aimed* attack.

Computer Sight (TL8). Includes a targeting program (+1 Gunner/Guns), a laser rangefinder (+3 Acc out to 4,000 yards), 3-9× magnification (+1 to +3 Acc), and *either* Night Vision 7 *or* Infravision. Adds -2 Bulk. $22,500 (with Night Vision) or $30,000 (with Infravision), 10 lbs., M/30 hrs. LC2.

Mini-Computer Sight (TL8). Includes a targeting program (+1 Gunner/Guns), a laser rangefinder (+3 Acc out to 2,000 yards), 2-4× magnification (+1 to +2 Acc), and *either* Night Vision 7 *or* Infravision. Adds -1 Bulk. $12,500 (with Night Vision) or $20,000 (with Infravision), 2.5 lbs., 2×S/2 hrs. LC2.

Thermal-Imaging Sights (TL8)

Electronic passive IR-imaging sights for nighttime target acquisition have been available since the 1980s. Shooters using such devices have Colorblindness (p. B127) and Tunnel Vision (p. B151). See *Thermographs* (p. 48) for other important details.

Thermal-Imaging Sight (TL8). Gives Infravision and +2 Acc, and adds -2 Bulk. $8,000, 5 lbs., M/5 hrs. LC3.

Improved Thermal-Imaging Sight (TL8). A lighter 1990s-era sight still gives Infravision and +2 Acc, but adds only -1 Bulk. $8,000, 4 lbs., M/10 hrs. LC3.

Advanced Thermal-Imaging Sight (TL8). By the 2000s, these sights give Infravision and +2 Acc without affecting Bulk. $10,000, 1 lb., 2×S/2 hrs. LC3.

Sound Suppressors

The sound of a gun firing is the sonic boom of the supersonic propellant gases and possibly the projectile. The speed of sound at sea level is about 1,086 feet per second, but the muzzle velocity of a 9×19mm pistol round is approximately 1,200 fps and that of a military rifle is 2,500-3,500 fps – and powder gases travel at over *4,500* fps! A sound suppressor, often called a "silencer," confines and slows gases and/or projectile before they leave the barrel, reducing noise.

The Maxim Silent Firearms Co. introduced the first commercially available suppressor in 1908; it was widely used for indoor target shooting. Silencers generally remained legal in the U.S. until the gangster and subversive hysteria of the 1930s. After 1934, they were regulated: some states banned private sale, while others required registration and a $200 Federal tax.

Today, most countries outlaw suppressors. In some noise-conscious European nations like Finland, though, rifle (and even MG) suppressors are legal and sometimes *required* for sport shooters. Military and espionage services have easy access to silencers, of course, and an armorer or a machinist can *make* one (see *Home-Built Suppressors,* p. 159).

A suppressor doesn't *completely* negate a firearm's report (but see *Cinematic Silencers,* p. 159) – it merely reduces the range at which it's heard and identifiably a gunshot. The *Hearing Distance Table* gives the range at which an unsuppressed shot is audible on an unmodified Hearing roll.

Hearing Distance Table

Sound: Weapon sound in question (other sounds included for comparison).

dB(A): Decibel range at muzzle, weighted for human hearing.

Range: Distance (in yards or miles) at which sound is audible on an unmodified Hearing roll.

Sound	*Range dB(A)*	*Range (yards)*	*(miles)*
Leaves rustling, stalking person	40	0.25	-
Quiet conversation, walking person	50	0.5	-
Conversation, cocking or reloading firearm, attaching bayonet	60	1	-
Light traffic	70	2	-
Bow, loud conversation, noisy office	80	4	-
Crossbow, shouting, gasoline engine	90	8	-
Air gun, firearm firing "silent" ammo, revving gas engine	100	16	-
Loud clapping, diesel engine, auto horn, motorcycle	110	32	-
Chainsaw, oxygen torch	120	64	-
Very light pistol or rifle (.22 LR), musket	130	128	-
Light pistol (.32 ACP, .380 ACP), grenade launcher	140	256	0.15
Heavy pistol (9×19mm, .45 ACP), SMG, rifle, shotgun	150	512	0.3
Magnum rifle (.300 WM, .600 H&H), HMG, stun grenade	160	1,024	0.6
Artillery, small explosion	170	2,048	1.2
Tank gun, large explosion	180	4,096	2.3

Apply +1 to Hearing per range step by which the listener is closer to the sound source, -1 per step by which he's more distant. For distances between two lines on the table, use the *higher* of the two. A suppressor adds a *further* penalty.

Example: A Walther PPK (a light pistol) is audible on an unmodified Hearing roll at 256 yards. At 300 yards, the roll is at -1. With a suppressor that gives -2 to Hearing, the roll is at -3.

The listener's *location* also matters. It's harder to hear a gunshot outside a cone in front of the gun's muzzle. Individuals located behind or far off to the side of the muzzle have -1 to Hearing. The GM may apply other modifiers:

Background noise: -5 for busy street; -6 for blaring TV set; -10 for fireworks

Intervening terrain: +1 for bare concrete (reflects sound); -1 to -3 for heavy vegetation (muffles sound)

Listener distracted: -2 or -3 (see p. B548)

Listener unfamiliar with firearms (*no* points in Guns): -4

Listener wearing winter clothing over ears: -1 to -3

Shot fired through pillow: -1

Suppressors work better on some guns than on others. They're most effective with sealed breeches such as bolt-actions or dropping blocks: -1 to Hearing. They work fairly

well on semiautomatics, but such weapons often leak high-velocity gas from the breech and always have the noise of the action working (but see *Slide-Lock*, p. 161). Suppressors don't work at all on ordinary revolvers; it's possible to construct a revolver so tightly fitted that it *can* be silenced (see *Nagant R-1895*, p. 95), but this is more an exercise in perverted ingenuity than in practical design.

A detachable suppressor requires a means to attach it, usually an extended barrel with a thread or attachment lugs. Attaching or removing a suppressor takes five seconds if threaded, three seconds if a TL8 quick-detach model. Most suppressors add length to the gun, worsening Bulk.

Baffle Suppressors (TL6)

Most suppressors are of this type. They work by diffusing the muzzle blast and firing gases inside a baffled expansion tube (which has many tiny compartments). Lifetime is typically hundreds of shots – even tens of thousands of shots, by late TL7.

Detachable Baffle Suppressor, .22-caliber (TL6). -1 to -4 Hearing. -1 Bulk. $100 per -1 Hearing, 0.25 lb. LC3.

Detachable Baffle Suppressor, Pistol or SMG (TL6). -1 to -4 Hearing. -1 Bulk. $250 per -1 Hearing, 1 lb. LC3.

Detachable Baffle Suppressor, Rifle (TL6). For rifles firing 5.56×45mm NATO, 7.62×51mm NATO, or similar. -2 to -4 Hearing. -1 Bulk. $250 per -1 Hearing, 1.5 lbs. LC3.

Detachable Baffle Suppressor, Oversized (TL8). Primarily for large-caliber rifles, such as .50 Browning weapons, but also available for some MGs. -2 to -4 Hearing. -2 Bulk. $400 per -1 Hearing, 5 lbs. LC3.

Wiper Suppressors (TL6)

A wiper suppressor is a tube divided into compartments by "wipes" placed perpendicular to the barrel. The bullet passes through a sub-caliber hole in each wipe, while blast and gases are trapped in the compartments. Wipes are made of elastic materials such as oiled leather, rubber, or polyurethane, designed to close behind the bullet. This design means that wiper suppressors slow the projectile (causing it to lose power) and lose effectiveness after a few dozen shots, but also makes them more effective *suppressors* than baffle designs.

Detachable Wiper Suppressor, Pistol or SMG (TL6). Multiply Dmg and Range by 0.8. Good for 40 shots. -2 to -4 Hearing. -1 Bulk. $150 per -1 Hearing, 0.5 lb. LC3.

Detachable Wiper Suppressor, Rifle (TL6). For rifles firing 5.56×45mm NATO, 7.62×51mm NATO, or similar. Multiply Dmg and Range by 0.5. Good for 40 shots. -2 to -6 Hearing. -1 Bulk. $150 per -1 Hearing, 1.5 lbs. LC3.

Dirty Tech: Home-Built Suppressors

To *design* a suppressor, make an Engineer (Small Arms) roll. At TL7-8, a Research roll will suffice – instructions are easy to find in survival guides and military manuals, and on the Internet.

To *build* a suppressor, roll against Armoury (Small Arms), which defaults to Machinist-5. Common modifiers include up to +2 for actual blueprints or a working sample, the quality of your tools (p. 24), and +1 to +5 for extra time (p. B346). Failure means the first shot fired through the suppressor triggers a roll on the *Firearm Malfunction Table* (p. B407); critical failure damages the gun.

Suppressor quality modifies these assumptions and determines the time required:

Poor-quality suppressors can be built in 30 minutes from everyday items: tape, plastic bottles, Styrofoam chips, chicken wire, etc. Those with the Guns or Armoury skill don't even need to roll; complete neophytes must make an IQ roll. Poor suppressors last for only 1d shots and give just -1 to Hearing rolls. They bestow -1 Acc, -1 Malf., and -1 Bulk, and weigh 0.5 lb.

Average-quality suppressors take two hours to assemble from rubber washers, plastic pipe, and pipe fittings. They're slightly more complicated than poor-quality ones: an Armoury roll is required, but at +4. (This is well-illustrated in the film *Ghost Dog.*) Average suppressors last for 3d shots and give -2 to Hearing rolls, becoming -1 to Hearing after firing half the shots. They give -1 Bulk – but no Acc or Malf. penalties – and weigh 1 lb.

Good-quality suppressors are home-made copies of low- to mid-range commercial models (up to -3 Hearing). They take eight hours to build and require a workshop (p. 24). Use the stats for production suppressors, but price is 1/3 usual (for materials) and weight is often slightly higher.

Fine-quality suppressors have all the requirements of good suppressors, but take 16 hours to build and the skill roll is at -2. Use the stats for the *best* available commercial suppressors, but cost is 1/2 usual (for materials).

Cinematic Silencers

The suppressor rules aim to represent *realistic* sound levels – not the Hollywood fiction of near-silent gunshots. In a cinematic campaign, the GM may wish to improve silencer effectiveness dramatically, doubling or even tripling Hearing penalties!

Stocks, Tripods, and Bipods

Several add-ons are available to make guns more manageable. Many firearms include these features in their cost and weight, or don't use the generic versions below – check your weapon's description first.

Pistol Stocks (TL5)

A removable shoulder stock can convert a handgun into a carbine of sorts, improving accuracy and reducing felt recoil at the cost of increasing weight and making the weapon less handy. The pistol must be prepared to accept the stock by having a slot or groove in the grip. Attaching or removing the stock takes three seconds. While the stock is attached, use Guns (Rifle) to shoot, add +1 Acc and -1 Bulk, and multiply ST by 0.8 (round *up*). Many stocks are hollow, allowing storage of small items (ammo, a gun-cleaning kit, etc.); some can hold the gun itself when it isn't in use.

Pistol Stock (TL5). $100, 1 lb. LC3.
Pistol Stock (TL7). $100, 0.5 lb. LC3.

Shooting Sticks (TL5)

Buffalo hunters sometimes propped long arms on "bipods" made from crossed sticks fastened with rawhide strips. A *sitting* marksman may treat a gun resting on shooting sticks as braced (see *Aim,* p. B364). $5, 1 lb. LC4.

Tripods and Other Mounts (TL5)

Tripods are three-legged mounts for such heavy weapons as machine guns and recoilless rifles. A tripod provides at least a 180° arc of fire – those for antiaircraft fire provide a 360° arc – and allows the weapon to be elevated or depressed. The shooter usually sits or kneels behind the tripod. While his weapon is mounted, he may treat it as if it were braced and *ignore* its ST requirement; see *Aim* (p. B364) and *Bipods and Tripods* (p. B412). Setting up or collapsing a tripod typically requires six seconds. Attaching or detaching the weapon takes a further three seconds.

Some mounts have four or more legs, or wheels, or are shaped like sleds. These use exactly the same rules as tripods. Tripods and other mounts vary widely in cost and weight, depending on materials and the weapons they're designed to support; see the individual weapon descriptions. All such mounts are LC4.

Bipods (TL6)

Bipods are integral to some weapons – especially MGs – and can be fitted to others. This is most common for rifles, but SMGs and even long-barreled revolvers have been so equipped! Bipods on MGs and heavy rifles function mainly to relieve the shooter of some of the weight. Others are installed for better accuracy.

If a weapon has an attached bipod, a *prone* shooter may treat it as if it were braced (see *Aim,* p. B364) and multiply its ST requirement by 2/3 (round *up*). Opening or closing a folded bipod requires a Ready maneuver. If the shooter isn't prone, the GM may allow the bonus for bracing if the bipod can reasonably be set on something stable – chest-high wall, pile of sandbags, window ledge, etc.

Bipod (TL6). Available in fixed, semi-permanent, and quick-detach models (five seconds to install/remove). $100, 2 lbs. LC4.
Bipod (TL7). As above, but $100, 1 lb. LC4.
Bipod (TL8). As above, but $100, 0.5 lb. LC4.

Folding Stock (TL7)

The fixed shoulder stock of some long arms – but *not* that of weapons where the stock houses part of the action, or the magazine – can be replaced with a stock that folds or retracts to make the gun more compact. Folding such a stock removes -1 from Bulk; firearms that already include this feature indicate it with an asterisk (*) next to Bulk. While folded, also apply -1 to Acc and +1 to Recoil (unless Rcl is 1), and multiply ST by 1.2 (round *up*). Folding or unfolding the stock requires a Ready maneuver. All but the flimsiest folding stocks increase overall weight. $100, 0.5 lb. LC3.

Miscellaneous Accessories and Modifications

The following items can make a shooter's life easier in a variety of ways.

Gun-Cleaning Kit (TL4)

A clean gun has been the mark of the professional shootist – from murdering thug to military sniper – since the dawn of firearms. Black-powder marksmen usually carry a multi-tool (p. 26) incorporating nipple key, vent pricker, oil bottle, screwdriver, double-pronged worm for cleaning, and tools for extracting jammed bullets. More modern kits fit in a small pouch and contain collapsible cleaning rod, cleaning patches, brush, cleaning solvent, and lubricant. Machine gunners are often issued a belt pouch that includes cleaning equipment and a few small spare parts. For game effects, see *Cleaning and Maintenance* (p. 80). $20, 0.5 lb. LC4.

Gun Case (TL5)

From the 1700s, high-quality dueling and target pistols were traditionally kept in a wooden case with their accessories – including a mold for the exact-sized ball. African safari hunters kept their elephant guns in velvet-lined strongboxes to protect against both the weather and light-fingered porters. Padded aluminum and hard plastic cases serve the same purpose today. A typical TL8 model is 4' long and holds a sniper rifle or two SMGs, plus spare magazines and other accessories. It is waterproof and lockable, and has DR 2. $250, 25 lbs. LC4.

Brass Catchers (TL6)

A "brass catcher" is a bag or other container attached to a gun's ejection port to catch spent cartridge cases (the "brass"). Sport shooters use them to collect cases for reloading (see *Handloading and Reloading,* p. 174). Aircrews firing from within aircraft employ them to avoid the dangers of hot brass flying around the cabin – or into intakes or propellers. Covert operators, assassins, and others who can't afford to leave evidence behind also find them useful. As a field expedient, soldiers sometimes tape a sturdy plastic pouch (often taken from military rations, p. 35) to the gun.

MG Brass Catcher (TL6). Holds 500 cases. Adds -2 Bulk. $75, 2 lbs. LC4.

Pistol Brass Catcher (TL6). Holds 20-30 cases. Adds -1 Bulk. $50, 0.5 lb. LC4.

Rifle/SMG Brass Catcher (TL6). Holds 60-100 cases. Adds -1 Bulk. $50, 1 lb. LC4.

In all cases, halve weight at TL8.

Slide-Lock (TL6)

A slide-lock prevents the action of a semiautomatic firearm from cycling. This reduces mechanical noise when used with a sound suppressor (pp. 158-159), giving -1 to Hearing, but effectively converts the gun to a RoF 1 manual repeater – the operator must rack the slide after every shot to chamber a new cartridge. A slide-lock only comes standard on such specialized weapons as the Izhmekh PB (see *Izhmekh PM,* p. 100), but a gunsmith can add one to any semiautomatic with an Armoury (Small Arms) roll and two hours' work. $50, neg. LC4.

Accessory Rails (TL7)

Many firearms feature integral rails for mounting accessories. Typically located on the receiver of a rifle or under the barrel of a modern pistol, these allow the user to attach and detach accessories quickly (a Ready maneuver). Weapons without rails require gunsmithing to provide a stable mount for optics and sighting aids. Duct tape (p. 26) will do in a pinch, but it *won't* suffice for a device that gives an Acc or skill bonus!

Strips of rail can be added to any suitable weapon surface – notably the top of the receiver (for sights and scopes) and around the forearm (for tactical lights, targeting lasers, and underbarrel grenade launchers). Each rail typically mounts one item, although long rails can hold more; e.g., an add-on night sight *and* a scope, front-to-back. A one-position rail costs $100; a three- or four-position rail (sides, plus bottom and/or top), $200. Integral rails have no weight, but add-on versions increase weight by 0.2 lb. per facing. LC4.

Drag Bag (TL7)

A sniper may use a padded "drag bag" to protect his rifle while creeping along the ground. A typical bag is camouflaged, has internal compartments and external pouches for small items, and can be worn as a backpack. It may unfold for use as a sniper mat once the sharpshooter reaches his objective. Its thick skin has DR 1. $250, 4 lbs. LC4.

Ammunition and Warheads

"Ammunition" includes both the projectile launched from a firearm, air gun, or rocket launcher and the means to propel it – be that a charge of black or smokeless powder or a reservoir of compressed air.

Calibers

Caliber designations are an arcane lore. Two systems are most popular today:

- The older *Imperial* system gives caliber as a fraction of an inch; e.g., the .45 ACP cartridge has a caliber of 0.45" (11.43mm).
- The *metric* system – more widely used nowadays, especially in the military – specifies caliber and case length in millimeters; e.g., the 9×19mm Parabellum round has a 9mm (0.355") caliber and a cartridge case 19mm long.

Imperial designations are often converted to metric; e.g., the .50 Browning is also called the 12.7×99mm. The *Ammunition Tables* (pp. 175-177) list both Imperial and metric, where applicable. Specific weapon descriptions and the weapon tables note only the more common designation.

In either system, the caliber is often a "notional" caliber, meaning that it doesn't correspond *exactly* to its name. Many metric designations for rifled guns give the barrel's smallest diameter ("measured from the lands") as caliber, but actually fire projectiles as wide as the barrel's largest diameter ("measured from the grooves"); e.g., the 7.62×51mm NATO (nominally 0.30") fires a 7.82mm (0.308") projectile. Most Imperial designations are rounded or otherwise inaccurate; e.g., the .38 Special (0.38" equaling 9.65mm) actually fires a 9.06mm (0.357") projectile – as does the .357 Magnum.

Optional Wounding Rules

Those seeking brutal realism in the aftermath of gunplay may find these *optional* injury rules useful. See ***GURPS Martial Arts*** for related options.

Body Hits

People shot in the torso don't usually die instantly – they pass out and gradually bleed to death, unless they receive medical assistance. However, the "torso" hit location encompasses the *entire* torso, including the "vitals" contained within . . . things like the heart, lungs, kidneys, and several major blood vessels. Occasionally, then, a torso hit *could* mean instant or near-instant death.

Whenever an attack that inflicts *impaling, piercing,* or *tight-beam burning* damage hits the torso, roll 1d. On a 1, it actually strikes the vitals, with the effects stated on p. B399. On a 2-6, the results depend on whether you use *Bleeding* (p. B420) – which is optional – in your game.

If you don't use *Bleeding,* injury can't exceed *twice* the target's HP. Any excess is lost.

If you do use *Bleeding,* injury can't exceed the target's HP. Any excess is lost *but still counts when determining the HT penalty for bleeding rolls.*

Do the same for a groin wound – but don't bother checking for a vitals hit!

Overpenetration (p. B408) is unaffected. A body used as cover blocks as much damage as it has HP.

Example: Assassin Luís "El Chacal" Morales has no clear shot at *El Presidente,* so he opts to shoot *through* the bodyguard who's shielding his target. Luís hits the torso and does 23 points of damage to the bodyguard, who has HT 11 and 11 HP. He rolls 1d for a vitals hit but doesn't get a 1.

Using the first option, the bodyguard suffers 11 × 2 = 22 HP of injury and goes to -11 HP. This is potentially lethal, so he must roll against HT 11: 3-11 means a nonlethal hit; 12-13, a mortal wound (p. B423); and 14-18, instant death. On a nonlethal hit, he must make another HT roll to remain conscious, at -1 for -HP.

Using the second option, the bodyguard suffers 11 HP of injury and goes to 0 HP. He must roll against HT 11 to stay conscious. After a minute, he starts making HT rolls at -4 to avoid further HP loss to bleeding. The *entire* penetrating damage of 23 points determines the penalty, not just his 11-HP wound.

In either case, the bullet exits his body with enough energy to inflict 23 - 11 = 12 points of damage to *El Presidente,* behind him.

Limb Hits

While an attack that's neither cutting nor explosive *can* dismember (p. B421), the injury threshold is realistically much higher. Notably, bullets are more likely to pass through a limb or an extremity than to blow it off. Optionally, a body part is automatically permanently crippled (p. B422) if it suffers at least twice the injury needed to cripple it – but *impaling, piercing,* and *tight-beam burning* attacks must inflict twice *that* amount to sever the body part.

Stopping the Bleeding

Severe bleeding can be difficult to stop. Make bleeding rolls for skull, eye, neck, or vitals injuries every 30 seconds. The usual -1 per 5 HP of injury applies, but add a *further* -2 for the neck or -4 for the vitals. Apply the same total penalty – for wound size and wound location – to First Aid rolls for bandaging (p. B424). If the bleeding is from the skull, eye, neck, or vitals, make a Surgery roll at the same penalties; First Aid won't suffice.

"You Shot Me, Mister!"

Getting wounded is a traumatic experience for body *and* mind! The GM might require those who receive a serious wound (any torso or head injury of 4+ HP) to roll a Fright Check (p. B360) on the following turn. Loss of a limb, or a wound that breaks a bone, spurts lots of blood, etc., should give -4 or worse. Combat Reflexes helps, as always. The GM may give a bonus to PCs with experience around severe injuries – emergency medical personnel, veteran soldiers, etc. – *if* their skills match their background.

Two older caliber designations are sometimes used:

- *Pounder* refers to the nominal projectile weight in pounds of a cast-iron ball; e.g., a 12-pounder fires a ball weighing 12 lbs., nominally of 115mm caliber.
- *Gauge* refers to the number of lead balls of bore diameter that would make one pound; e.g., 12-gauge means that 12 perfect lead balls exactly fitting the caliber (nominally 18.5mm or 0.73") are "gauged" (determined) to weigh 1 lb. Thus, the higher the gauge, the *smaller* the caliber – a 12-gauge has a larger caliber than a 20-gauge (15.6mm or 0.61").

In practice, these older systems were rarely so precise. Different nations had their own standards; e.g., a Prussian inch was 1.03", a French inch was 1.07", and a French pound was 1.08 lbs. Neither lead nor cast iron had a firmly standardized density. For muzzleloaders, there had to be an allowance for "windage" – that is, balls had to be smaller than the bore in order to load. Finally, some militaries measured projectile diameter while others used internal barrel diameter. Thus, cannonballs for historical 12-pounders could easily weigh more or less than 12 lbs. and have calibers ranging from 70mm to 120mm. The M1857 "Napoleon" (p. 138) actually fired a 12.3-lb. ball of 112mm.

Bullet Size and Damage

The greater a bullet's *actual* diameter (not its nominal caliber!), the more tissue damage it does. Diameter therefore determines damage type. As usual, this affects wounding, not penetration – see *Damage* (p. B268) and *Damage and Injury* (p. B377).

Under 4mm (under .16 caliber): Damage type is *small piercing* (pi-).

4mm to 7.99mm (.16 to .31 caliber): At low velocities (pistol cartridges or black-powder weapons), damage type is *small piercing* (pi-); this models the behavior of rounds like the .32 ACP (which fires a 7.95mm bullet), .25 ACP, and .22 LR. For bullets of this caliber fired from high-velocity weapons (such as most centerfire rifles), damage type is *piercing* (pi).

8mm to 9.99mm (.32 to .39 caliber): Damage type is *piercing* (pi). This is the default – there's no size modifier for bullet damage.

10mm to 14.99mm (.40 to .59 caliber): Damage type is *large piercing* (pi+).

15mm and over (.60 caliber and over): Damage type is *huge piercing* (pi++).

Propellants

"Propellant" is so named because it propels the projectile out of the firearm, usually through a chemical reaction. At TL5, the only propellant available is some variety of black powder (pp. 183-184); grades include serpentine black powder, corned black powder, improved black powder, and semi-smokeless powder. At TL6-8, most firearms use smokeless powder (p. 185), a generic name for any of several chemicals that are neither entirely smokeless nor powders . . .

Ammunition Classes

There are several basic classes of ammunition. Except where specifically noted, these *aren't* interchangeable – a gun designed to fire one class can't use the others, regardless of caliber.

Multi-Part Ammunition

With multi-part ammo, one loads projectile, propellant, and sometimes primer (which ignites the propellant) individually. Such ammunition is slow to load but lightweight – and the ability to vary the charge is useful (see *Extra-Powerful,* p. 165). Most early TL5 rounds are multi-part. At late TL5 and beyond, multi-part ammo is used mainly in artillery, as it makes optimizing indirect-fire range easier.

Powder and Shot (TL3)

Until the self-contained metallic cartridge emerges at late TL5, ammo is stored and shipped loose as three separate components: *charge* (the powder), *shot,* and *wadding.*

The charge is loose gunpowder – usually some form of black powder (pp. 183-184) – carried in a watertight metal flask or a hollowed-out horn. A typical powder horn holds 1 lb. of powder, enough for 40 musket firings, and costs $15. A TL5 self-measuring powder flask has a nozzle that accepts one charge of powder and then shuts off the rest of the flask. It holds 0.75 lb., enough for 30 musket firings, and costs $30.

With flintlocks, a small quantity of gunpowder – the *priming* – is sprinkled into the priming pan where the sparks from the flint drop, to ignite the charge. Some late-TL5 weapons are self-priming: the lock includes a small propellant container from which the correct amount of priming is automatically dispensed when the striker is cocked. For more on locks, see *Black-Powder Locks* (p. 164).

The shot is a projectile or multiple projectiles. The wadding is cloth, paper, or leather. Wadding goes over the charge to provide a gas seal and over the shot to hold it in the barrel.

At TL5, soldiers usually carry powder and shot in the form of *paper cartridges* (first introduced in the late 16th century): shot and charge wrapped in paper. These aren't cartridges in the modern sense, but merely a convenient way to prepackage a shot's worth of propellant and ball. Throughout the 18th and 19th centuries, church hymnals were a favorite source of cartridge paper. The troops invariably spent the evening before a battle around the fire, preparing cartridges for the next day and placing them in their cartridge pouches (see *Load-Bearing Equipment,* p. 34). To use a paper cartridge, the shooter simply bites off one end, primes the pan, pours the charge down the barrel, and then rams the shot and paper wrapping home with a ramrod. This halves the time required for reloading (see *Reloading Your Gun,* p. 86).

Dirty Tech: Home-Made Powder and Shot

A big advantage of powder and shot is that it's easily produced. Black powder is relatively cheap – and a small amount goes a long way! It can even be made at home (see *Home-Cooked Explosives,* p. 186).

Shot is normally made of soft lead, with black-powder muskets getting 10-20 balls to the pound, depending on caliber. Buying lead ingots rather than prepared shot lets you cast bullets as needed. Alternatively, you can scrounge – lead is easily recognized and often locally available. At TL3-5, sources include dinnerware, roof gutters, clock weights, toy soldiers, plumbing, and window leading. In urban areas up to TL6, an hour and a successful Scrounging roll will turn up a pound of lead plus pounds equal to the margin of success. At TL7-8, pure lead is less common outside of such things as car wheel weights, vehicle batteries (see *Dirty Tech: Batteries,* p. 13), and fishing sinkers; Scrounging rolls are at -2.

Lead melts at 621°F – a campfire will suffice – and few special tools are needed to cast it. A simple set of bullet-molding equipment, like that often carried by TL4-5 frontiersmen, is $25 and 1 lb; it includes a small iron ladle for melting and pouring lead, and a one-bullet brass mold. Even a single-cavity mold like this lets one make bullets *quickly* – a bullet per minute is a leisurely pace. It's an easy job, too; a black-powder bullet is either good or it isn't, and anybody can tell the difference. Producing a shotload or buck-and-ball is also straightforward, but requires an IQ-based Guns or Armoury (Small Arms) roll.

If you must resort to field-expedient projectiles like stones or coins, apply -1 to Acc and *halve* damage and range. Such ammo gives -2 to Malf., too – it's likely to damage the barrel!

Not considered ammunition, but nevertheless vital, are *igniters* . . . the devices that bring the fire to the powder. Flintlocks require flint or pyrites to produce the sparks that ignite the priming; each such igniter is good for at least 20 shots. Caplocks require percussion caps (introduced in 1814), which are single-use items. Individually, igniters have negligible weight; they're often transported by the thousands in wooden barrels or crates. Their cost is subsumed under ammunition cost.

Fixed Ammunition

Fixed ammo merges propellant, primer, and projectile into a unit. This speeds up reloading (see *Reloading Your Gun,* p. 86), enhances reliability, and ensures consistent performance, shot after shot.

Cased (TL5)

In 1835, Nicolas Flobert of France developed the metallic cartridge from the percussion cap. This evolved via the pinfire cartridge and the rimfire cartridge into the centerfire cartridge, patented by French gunsmith Pottet in 1857. The centerfire design supplanted its predecessors for military and big-game rounds, as it was better-suited to high-pressure loads. Metallic cartridge cases entered widespread use in the 1860s.

The majority of TL5-8 fixed ammunition uses a metallic cartridge case. This is typically made of brass or lacquered steel. Such a case is required for most really powerful rounds due to the problems of obturation (sealing the breech effectively against pressure loss).

Consumable Cased (TL5)

Consumable-cased rounds have a paper or polymer case that's completely or partially consumed upon firing, and must be fired from weapons specifically designed for them. They're actually an old invention – in the early 19th century, such breechloading rifles as the Hall (p. 108) and the Dreyse (p. 108) fired rounds with combustible paper cases. However, they were abandoned due to problems with sealing the breech, and saw little use for high-pressure loads until late TL7.

Semi-Consumable Cased (TL7). In the 1960s, consumable-cased rounds for tank guns often had a metal base cap to seal the breech. This "semi-consumable cased" ammo offered considerable weight savings nevertheless.

Light Cased (TL5)

Some cased rounds use light materials to reduce cartridge weight. Shotgun shells with composite cardboard/metal cases of the Lefaucheux pinfire type were developed in 1835. Centerfire cardboard/metal shotshells replaced these in about 1870. Aluminum cases date to the 1930s for grenade rounds (p. 143) and to the late 1970s for aircraft autocannon (where *any* weight reduction is significant). Working plastic-cased ammunition – usually with a metal base – appeared in high-powered rifle calibers in the 1970s but wasn't introduced commercially until 2003.

Light cased rounds are popular for shotshells by late TL5 but uncommon for high-pressure loads before TL8. At mid-TL8, most cased small-arms cartridges can be made light cased; multiply WPS by 0.7 and CPS by 2.

Example: The *Ammunition Tables* (p. 176) give a 5.56×45mm NATO cartridge WPS 0.027 lb. and CPS $0.5. Plastic-cased ammo has WPS 0.027 × 0.7 = 0.019 lb. and CPS 0.5 × 2 = $1.

Caseless (TL8)

Caseless ammo *lacks* a case, and can only be fired from weapons specifically designed for it. It has been worked on almost continuously since the 1940s, but the first practical designs only emerged in the 1990s. In theory, caseless ammo offers many advantages. It reduces ammo weight and saves

Black-Powder Locks

A black-powder weapon's *lock* is the device that ignites the powder. At TL5, the most common designs are:

Cannon Lock (TL3). A burning *match* (time fuse, p. 187) or a heated wire through a *touchhole* ignites the propellant, firing the gun.

Flintlock (TL4). Flintlocks have a *flint* (piece of flint stone) set into the spring-loaded *cock* (whence "cocking" the gun), which is released by the trigger. When the flint strikes the *frizzen* (a hinged steel component), the frizzen is thrown back – uncovering the *pan* holding the *primer* (a small amount of fine gunpowder) – and a shower of sparks is generated. The sparks ignite the primer in the pan, sending a flash of fire down the *vent hole* into the propellant charge in the firing chamber, thus firing the gun.

Caplock (TL5). Caplocks (also called "cap-and-ball") use a *percussion cap* to ignite the propellant. The cap fits over a *nipple* on the breech of the gun. The cap explodes when the *hammer* strikes it, sending a flash through a *vent* in the hollow nipple to the propellant charge, thereby firing the gun.

Cartridge Conversions

By the 1860s, the metallic cartridge was rapidly rendering cap-and-ball weapons obsolete. It was cheaper to convert these old guns to fire the new cartridges than to replace them. Some conversions were done "officially," at factories and government arsenals; others were the work of gunsmiths or frontier blacksmiths. Conversions were popular in the 1870s and 1880s, the most common examples being nearly every revolver of the American Civil War era (pp. 92-94) and the British Snider Pattern I rifle (see *Enfield P/1853,* pp. 108-109).

Note that on a revolver, only the cylinder is modified. The new cartridge can't exceed the cylinder's length. As well, the bullet must fit the bore: .44-caliber caplocks can be converted to fire .44 or .45 cartridges, .36-caliber caplocks to take .38 cartridges, and .31-caliber caplocks to accept .32 cartridges. Converted black-powder weapons can't fire Magnum rounds, however!

A cartridge conversion requires an Armoury (Small Arms) roll at -4 and three days' work.

materials. Guns built for it need no mechanism to extract and eject spent cartridges, improving reliability and rate of fire. And there are no cases to collect on the range, while hunting, or on a covert operation.

In practice, the absence of a case also poses several problems. Cases facilitate handling outside and inside the gun, act as a gas seal in the chamber, and protect the propellant from the elements and heat during firing. At TL7, prototype ammo is brittle and susceptible to moisture. Worse, it can "cook off" in automatic weapons: after a few bursts, the chamber gets hot enough that unfired rounds self-ignite! At TL8, military weapons prevent this by using high-temperature explosive instead of conventional propellant.

Ammunition Upgrades

These modifications improve the *complete* round of ammunition. Use *Projectile Options* (pp. 166-172) to modify just the projectile.

Extra-Powerful (+P) Ammunition (TL4)

Most multi-part or fixed ammunition can be given an extra-powerful propellant charge to eke out higher damage and better range. Such "hot" ammo mainly sees use in sidearms – typically with solid, hollow-point, AP, or APHC projectiles – but other rounds can be handloaded (p. 174) to similar effect with the Armoury (Small Arms) skill. Powder-and-shot weapons can be loaded as the shooter sees fit, but he must make an Armoury (Small Arms) roll or an IQ-based Guns roll at -2 to stay within his weapon's safe limits.

Most TL5-6 firearms – and cheap-quality TL7-8 guns – *aren't* designed to withstand such increased pressure in prolonged service: -1 to Malf. Automatic weapons are often sensitive to changes in propellant; they, too, may suffer Malf. penalties, and RoF is likely to increase. Multiply Dmg, Range, and ST by 1.1. Multiply CPS by 1.5.

Example: A "Kentucky rifle" (p. 107) does 4d-1 pi+. By increasing the powder charge, it could do 13 × 1.1 = 14.3, divided by 3.5 = 4.09 or 4d pi+ (see *Adjusting Damage,* p. 166). ST would increase to 9† × 1.1 = 9.9 or 10†.

Match-Grade Ammunition (TL6)

Carefully matching projectile and propellant can increase a round's accuracy – especially when done for a specific model of gun. While such ammunition can sometimes be bought in small lots, it must usually be handloaded (p. 174). This option can't be combined with *Extra-Powerful* (above), and the projectiles must be solid, hollow-point, AP, or APHC. Match-grade ammo is used in sniper rifles and target-shooting firearms – not in automatic weapons.

Multiply Acc by 1.25 and drop fractions; maximum Acc bonus is +1. Double CPS.

Example: A Glock 23 pistol (p. 101) with Acc 2 wouldn't benefit from match-grade ammo, since 2 × 1.25 = 2.5, which rounds to 2. An Accuracy International AWM sniper rifle (p. 118) with Acc 6 *would* benefit, as 6 × 1.25 = 7.5, which rounds to 7.

Subsonic Ammunition (TL6)

Subsonic ammunition has a muzzle velocity below the speed of sound (1,086 feet per second at sea level), resulting in a lower sound signature and increasing the effectiveness of sound suppressors (pp. 158-159). Some pistol and SMG rounds, such as the .32 ACP, .380 ACP, 9×18mm Makarov, and .45 ACP – and a few rifle chamberings, like the 9×39mm – are already subsonic and don't need this option. Others, including the .22 LR, the 9×19mm Parabellum, all PDW rounds, and most rifle rounds, are supersonic, and will benefit from subsonic ammunition. This option is only available for fixed ammo – most powder-and-shot ammo is subsonic anyway.

For pistol rounds, subsonic ammunition gives -1 to Hearing; multiply Range by 0.8. For PDW and rifle rounds, subsonic ammunition gives -2 to Hearing; multiply Dmg and Range by 0.6. In all cases, multiply CPS by 1.3.

> *. . . it looked like the one with the magazine down the top of the barrel. Shot that caseless ammo looked like wax crayons, plastic propellant molded around alloy flechettes like big nails.*
>
> *– William Gibson,* ***Virtual Light***

Silent Ammunition (TL7)

Exotic "silent" rounds trap the propellant gases inside the case and launch the projectile with a piston, eliminating muzzle flash and smoke, and reducing noise. Most require a specially designed weapon to fire them; a few pistols have been chambered for such ammunition since the 1960s. Silent rounds interchangeable with normal ammo were developed for conventional shotguns (see *Exotic Shotgun Ammo,* p. 103) and grenade launchers (see *Grenade Launcher Ammo,* p. 143) in the 1960s, too, but neither caught on. "Silent" grenades are only truly silent if they're not explosive, of course! This option is only possible for cased ammo.

In all cases, use the 16-yard line on the *Hearing Distance Table* (p. 158). Multiply CPS by 10. LC1.

Adjusting Damage

Many ammunition upgrades and projectile options require a recalculation of weapon statistics. Unless instructed otherwise, always round toward the nearest whole number. Damage is a special case. For damage dice *without* adds (e.g., 3d), apply the multiplier, retain fractions, and skip to the bulleted results below. For damage dice *with* adds (e.g., 3d-1), follow this three-step process first:

1. Multiply damage dice by 3.5, retaining fractions, and add the damage bonus or penalty.
2. Apply the multiplier for the chosen option to the result. If using more than one option, apply their multipliers in succession (e.g., ×1.1 and ×1.3 would multiply damage by 1.1 × 1.3 = 1.43) – *don't* add them together as you would enhancements and limitations (p. B101).
3. Divide the result by 3.5, retaining fractions.

- *Result less than 1.0.* Convert as follows: 0.01-0.32 = 1d-5; 0.33-0.42 = 1d-4; 0.43-0.56 = 1d-3; 0.57-0.75 = 1d-2; 0.76-0.95 = 1d-1; and 0.96+ = 1d.
- *Result between 1.0 and 12.0.* Take the whole number as the dice of damage and then add a bonus based on the fractional remainder: up to 0.14 gives no bonus; 0.15-0.42 gives +1; 0.43-0.64 gives +2; 0.65-0.85 gives +1d-1 (that is, round up to the next full die and apply a -1 penalty); and 0.86 or greater rounds up to the next full die.
- *Result greater than 12.0.* Divide the result by 6 and round to the nearest whole number, *n*. List damage as 6d×*n*. Multiples of 6d give the most statistically pleasing results, but you can also use multiples of 4d to 8d.

Example: El Chacal plans to assassinate the local *presidente.* Since the target always travels in an armored limo, he designs and handloads APDSDU rounds (p. 169) for his Mexican-made G3A4 rifle (see *H&K G3A3,* p. 116). These multiply damage by 1.5, add an armor divisor, and change damage type. Basic damage is 6d+2 pi; 6 × 3.5 = 21, and adding the +2 gives a total of 23. The new damage is 23 × 1.5 = 34.5; 34.5/3.5 = 9.86, which converts to 10d(2) pi- inc. For ease of use, this can be written as 5d×2(2) pi- inc.

Projectile Options

The projectile is the most important part of the ammunition – the cartridge and even the gun ultimately exist only to get the projectile to the target. Many options appear below; read carefully to learn which are available for what types of rounds. All cost (CPS) multipliers assume large-scale production. Limited-production and experimental ammo might be anywhere from five to 10 times more expensive, at the GM's discretion.

Kinetic-Energy Projectiles (TL3)

These rounds work by propelling projectiles that rely on their speed, mass, and density to penetrate and damage the target. The default kinetic-energy projectile is *solid* – and this is what the Dmg, Acc, and Range listed for most firearms assume. Choosing a different option will modify some or all of these baseline stats, affect ammunition cost per shot (CPS), alter legality class (LC), and/or add special rules effects.

Solid (TL3)

A solid bullet is the baseline projectile for most small arms and early artillery. At TL3-5, it's a ball of soft lead for small arms, while artillery fires cast-iron or stone balls. At late TL5, it's a lengthened and streamlined projectile of hard lead. At TL6-8, it is a streamlined lead or steel projectile, enclosed in a sheath of metal such as copper alloy; this is known as "full metal jacketed" (FMJ).

Rifled Slug (TL6). This solid subtype is used in shotguns. Germany's Brenneke company introduced it in 1898, but it was uncommon in America before the 1950s. Multiply buckshot damage by four. Change damage type to pi++ for shotguns of 20-gauge and larger, or to pi+ for shotguns smaller than 20-gauge (and remember that the higher the gauge, the *smaller* the bore – see *Calibers,* pp. 161-163). Add +1 Acc. Multiply buckshot 1/2D by 2.5, Max by 1.5. Remove any multiplier after RoF. A slug can be further modified by other projectile options (e.g., *Frangible,* p. 167, and *Baton,* p. 168).

Example: A 12-gauge 2.75" buckshot load does 1d+1 pi per pellet. A rifled slug would do 1d+1 × 4 = 4d+4 pi++, or 5d pi++. A shotgun with RoF 3×9 would fire slugs at RoF 3.

Hollow-Point (HP) (TL5)

"Hollow-point" is a generic term for any number of expanding projectiles. These include so-called "dum-dum" bullets, as well as commercial "jacketed soft-point" (JSP) and "jacketed hollow-point" (JHP) types. Most have a cavity in the tip that causes the projectile to mushroom on penetration.

Expanding bullets have been widely available for rifles since the 1890s. Similar bullets in pistol calibers appeared around that time as well, but weren't common before about 1960 – and not until the 1970s for SMGs and semiautomatic pistols. In 1899, the Hague Convention declared expanding bullets illegal for war use; subsequently, they became very rare for military weapons. However, they've been popular with hunters since the turn of the 20th century (being more likely to stop an animal with one shot), and with police agencies and antiterror units as of the 1980s (being more effective, and less likely to ricochet or overpenetrate and hit bystanders).

Add an armor divisor of (0.5); objects without DR get DR 1. Change damage type: pi- becomes pi, pi becomes pi+, and pi+ becomes pi++ (no effect on pi++). Lower-velocity hollow-points (in technical terms, with a muzzle velocity below 1,400 fps), such as those fired from handguns or SMGs, may fail to expand. At the GM's option, the round only expands and gets its improved damage type on a roll

of TL-3 or less on 1d. At TL5-7, hollow-points give -1 Malf. in semiautomatic or full-automatic weapons. CPS is unchanged. LC3.

Poison (TL5)

Poison ammo fires a bullet with a cavity designed to introduce a blood or contact agent into the target's body. It was used *at least* as early as the 1860s, in the American Civil War, but the Hague Convention banned it for war use in 1899. A number of patterns were in service with secret agencies during WWII and the Cold War – including some intended for air guns (pp. 88-89).

Treat as a hollow-point bullet (above) that has the effects of one dose of poison as a follow-up attack. Suitable poisons include botulin toxin (p. 227), cyanide (p. B439), and ricin (p. 227). Silver shavings, holy water, concentrated garlic, and other exotic fillers might be effective against supernatural foes! Poison ammo must be handloaded (p. 174). Add the cost of one dose of poison to CPS. LC1.

Armor-Piercing (AP) (TL6)

Armor-piercing bullets are designed to penetrate more effectively than standard solid rounds. They employ a hardened tip or core, typically made of steel. Those used in TL6-7 tank and naval guns often add a tip or "cap" made of softer metal, which prevents deflection and shattering of the hardened core; thus, this ammo is sometimes known as "armor-piercing, capped" (APC) or "armor-piercing, capped, ballistic cap" (APCBC). AP ammunition became available for small arms and autocannon in the 1880s.

Add an armor divisor of (2). Multiply damage by 0.7. If caliber is below 20mm (0.80"), reduce damage type: pi++ becomes pi+, pi+ becomes pi, and pi becomes pi- (no effect on pi-). Multiply CPS by 1.5. LC2.

Armor-Piercing Hardcore (APHC) (TL6)

This ammo has a hard core of heavy metal (such as tungsten alloy) inside a lighter projectile body to increase penetration. Rounds for TL6-8 small arms typically have steel or lead projectiles, while those fired by TL6-7 tank guns and TL6-8 autocannon use light alloy projectiles – the latter sometimes being called "armor-piercing composite rigid" (APCR). APHC ammunition is available from 1916 for small arms, but is initially less common than AP owing to its cost.

Add an armor divisor of (2). If caliber is below 20mm (0.80"), reduce damage type: pi++ becomes pi+, pi+ becomes pi, and pi becomes pi- (no effect on pi-). Double CPS. LC2.

Frangible (TL6)

Frangible rounds are designed to shatter against hard surfaces, including thick glass and aluminum, thereby minimizing the danger of overpenetration. Originally intended for training purposes, at TL8 they see use in combat situations where a miss would be dangerous – whether because a ricochet might endanger bystanders or because the surroundings are fragile (for instance, in aircraft, museums, and industrial facilities). Shotgun shells loaded with frangible slugs are employed as "breaching rounds" to destroy locks, door hinges, etc.

Frangible rounds are typically made of a mix of powdered metal and plastics or clay, or contain tiny pellets that spread on impact (like Glaser Safety Slugs, introduced in 1974). The process of breaking up against the target reduces penetration but transfers most of the energy. Due to their lighter weight, frangible rounds have less range.

Add an armor divisor of (0.5); objects *without* DR get DR 1, while against targets *with* DR, overpenetration (p. B408) won't occur. Change damage type: pi- becomes pi, pi becomes pi+, and pi+ becomes pi++ (no effect on pi++). Multiply Range by 0.9. Multiply CPS by 1.5. LC3.

Example: A 12-gauge 2.75" shotgun fires a 5d(0.5) pi++ frangible slug point-blank at a standard door lock (DR 6, HP 3, and Unliving). The damage roll is 18. Against DR 6 × 2 = 12, that means 6 points of penetrating damage. On an Unliving target, a huge piercing attack gets only a ×1 wounding modifier (see p. B380). The lock suffers 6 HP of injury, goes to -HP, and fails (see p. B484).

Can I get armor-piercing, cyanide-tipped bullets, too?
– Bart Simpson, ***The Simpsons,*** *"Brother, Can You Spare Two Dimes?"*

Armor-Piercing Discarding-Sabot (APDS) (TL7)

This ammunition fires a sub-caliber (50% to 75% of base caliber) projectile in a lightweight sleeve called a "sabot," which falls away when the bullet leaves the barrel. The result is a faster projectile with a higher cross-sectional density. This improves both range and armor penetration.

APDS was introduced in 1944 for tank guns, and was one of the standard tank-gun loads through TL7. It continues to see service in autocannon at TL8. In small-arms use, APDS is sometimes known as "saboted light armor-piercing" (SLAP); it's available in rifle and MG chamberings, but not in pistol calibers. The smallest practical rounds are 7.62×51mm NATO and 7.62×54mmR Mosin-Nagant (both introduced in the 1990s), although there have been experiments with .221 Fireball and 5.56×45mm NATO.

Add an armor divisor of (2). Multiply damage by 1.3. If caliber is below 30mm (1.2"), reduce damage type: pi++ becomes pi+, pi+ becomes pi, and pi becomes pi- (no effect on pi-). Multiply Range by 1.5. Triple CPS. LC1.

Armor-Piercing Fin-Stabilized Discarding-Sabot (APFSDS) (TL7)

This ammo is similar to APDS (above), but uses a longer, finned projectile with a smaller diameter (less than 30% of caliber) to achieve even greater penetration. APFSDS was introduced in the 1970s for tank guns, and was the standard tank-gun load of late TL7. At TL8, it also sees use in autocannon and anti-materiel rifles. The smallest experimental chambering is .50 Browning – but it's *theoretically* possible to make APFSDS in smaller rifle calibers as well.

Add an armor divisor of (2). Multiply damage by 1.5. If caliber is below 40mm (1.6"), reduce damage type: pi++ becomes pi, and pi+ or pi becomes pi- (no effect on pi-). Double Range. Quadruple CPS. LC1.

Baton (TL7)

Baton rounds use reduced loads to launch large-caliber projectiles made of solid wood, plastic, or rubber at low speeds (in technical terms, with muzzle velocities around 300 fps). They're designed to stun rioters, but a close-range hit can still kill. Baton ammo was introduced for grenade launchers in 1967, and is also available for shotguns.

Minimum caliber is 10mm. For a shotgun, start with the damage and range of a rifled slug (p. 166). Add an armor divisor of (0.5). Divide damage by five. Damage is crushing, and does double knockback (pp. B104, B378) if caliber is over 35mm. Apply -1 to Acc. Divide Range by five. Double CPS. LC3.

Example: A 12-gauge 2.75" shotgun slug does 5d pi++. Firing baton, it would do 1d(0.5) cr.

Beanbag (TL7)

Beanbag rounds launch a fabric sack filled with metal or plastic pellets (the "beans"). This is folded up in the cartridge but expands after leaving the barrel, spreading the impact over a larger area to prevent serious damage. Such ammo became available in 1970 but wasn't popular until the 1990s. While typically fired from shotguns or grenade launchers, it's also available in some revolver chamberings.

Minimum caliber is 9mm. For a shotgun, start with the damage and range of a rifled slug (p. 166). Add an armor divisor of (0.2). Divide damage by five. Damage is crushing, and does double knockback (pp. B104, B378) if caliber is 15mm or larger. Reduce Acc to 0. Divide Range by eight. Triple CPS. LC3.

Example: A .38 Special revolver does 2d pi. Firing beanbag, it would do 1d-4(0.2) cr. A 12-gauge 2.75" shotgun with slug damage 5d pi++ would do 1d(0.2) cr dkb.

Semi-Armor-Piercing Fin-Stabilized Discarding-Sabot (SAPFSDS) (TL7)

With its long, finned projectile, SAPFSDS is similar to APFSDS (p. 167) but intended for small arms only. The arrow-shaped dart – often called a *flechette* (from the French *fléchette,* "little arrow") – is of small diameter (2mm or less) and made of steel or titanium. It has good penetration and range, but is expensive to make and of dubious stopping power. Such ammo has been used in experiments with assault rifles since the 1960s (see *Flechette Rifle,* p. 116), but has yet to enter service.

Maximum caliber is 10mm. Add an armor divisor of (2). Reduce damage type to pi-. Multiply Range by 1.5. Double CPS. LC2.

Exotic Bullets

The proverbial silver bullet is legend, but it's possible to make bullets out of almost any metal or other reasonably hard substance (stone, hardwood, etc.). *Possible* doesn't guarantee *optimal,* though! Many materials are expensive, difficult to work, and/or poorly suited for use in some firearms. In general, the more complex the weapon, the more complicated the exotic ammunition needs to be in order to withstand firing stresses and ensure the gun's reliable operation. Thus, it's prudent to reserve such projectiles for targets that are either immune to normal bullets or especially vulnerable to specific materials (see *Vulnerability,* p. B161).

For an example of the potential difficulties, consider silver. It has a high melting point (1,763°F); you need a blowtorch or a *really* hot flame to melt down ingots or jewelry, and a specially made mold that can withstand the molten metal (for more on making bullets for muskets and shotguns, see *Home-Made Powder and Shot,* p. 163). Silver is also soft, and will foul the barrel – and possibly the action – of rifled firearms, giving -1 or worse to Acc and Malf. (GM's discretion). Jacketed hollow-points (see *Hollow-Point,* pp. 166-167) avoid this problem: the jacket protects the barrel and the projectile mushrooms on impact, exposing the target to the silver. Manufacturing jacketed silver bullets gives -3 to Armoury (Small Arms) rolls, however (see *Handloading and Reloading,* p. 174).

Bullets made from medium- to high-density metals, such as silver or gold, do normal damage. For lighter materials, such as stone or jacketed wood, halve damage and range. For very light projectiles, such as pure hardwood or plastic, multiply damage and range by 0.1.

Example: After his first encounter with the supernatural, Special Agent Lafayette decides he needs something special for his Glock 23 (p. 101): silver hollow-points filled with garlic. Damage is the same as for a normal hollow-point – but depending on how vulnerable vampires actually are to silver and/or garlic, penetrating hits may get a special wounding modifier or do further follow-up damage. To handload such rounds, he must make an Armoury (Small Arms) roll at -3 for each batch. The *Ammunition Tables* (p. 176) list a CPS of $0.3 for .40 S&W. Hollow-points cost the same; making them silver multiplies CPS by 50 (see *Silver Weapons,* p. B275), for $15. The poison option increases CPS by the cost of a dose of poison, but the cost of garlic is negligible. Total CPS is $15.

Underwater Dart (UD) (TL7)

Some smoothbore small arms specially designed for underwater use – notably the H&K P11 (pp. 91-92) and the TsNIITochMash APS (p. 117) – fire long, cavitation-stabilized projectiles. Such "underwater darts" were introduced in the 1970s.

Change damage type to impaling. Multiply distance to the target by 25 – not by 1,000 – underwater (see *Firing Underwater,* p. 85). Double CPS. LC2.

Armor-Piercing Depleted Uranium (APDU) (TL8)

These rounds are similar to APHC (p. 167) but have a depleted uranium (DU) penetrator. DU isn't significantly radioactive, but it *is* pyrophoric. APDU ammo dates to the late 1970s and is used mainly in TL8 autocannon.

Add an armor divisor of (2). Multiply damage by 1.2. If caliber is below 20mm (0.80"), reduce damage type: pi++ becomes pi+, pi+ becomes pi, and pi becomes pi- (no effect on pi-). Treat as an incendiary attack (p. B433) if it penetrates non-flexible armor with DR 10+. Triple CPS. LC1.

Armor-Piercing Discarding-Sabot Depleted Uranium (APDSDU) (TL8)

This ammo resembles APDS (p. 167) but has a depleted uranium penetrator. A 1980s development, it sees use primarily in TL8 autocannon.

Add an armor divisor of (2). Multiply damage by 1.5. If caliber is below 30mm (1.2"), reduce damage type: pi++ becomes pi+, pi+ becomes pi, and pi becomes pi- (no effect on pi-). Treat as an incendiary attack (p. B433) if it penetrates non-flexible armor with DR 10+. Multiply Range by 1.5. Quadruple CPS. LC1.

Armor-Piercing Fin-Stabilized Discarding-Sabot Depleted Uranium (APFSDSDU) (TL8)

This is APFSDS (p. 167) with a depleted uranium penetrator. Introduced in the 1980s, APFSDSDU rounds are fired from TL8 tank guns and autocannon.

Minimum caliber is 10mm. Add an armor divisor of (2). Multiply damage by 1.7. If caliber is below 40mm (1.6"), reduce damage type: pi++ becomes pi+ and pi+ becomes pi. Treat as an incendiary attack (p. B433) if it penetrates non-flexible armor with DR 10+. Double Range. Multiply CPS by five. LC1.

Explosive-Energy Projectiles (TL4)

The most important element of these rounds (also known as "chemical-energy rounds") is an explosive charge – usually one tailored to deliver particular effects. No formulas are given for calculating explosive damage for all possible projectiles; such detailed rules are beyond the scope of this book. Many examples of explosive ammo appear in the weapon descriptions, however (see *Firearms,* pp. 28-153).

For details on explosive damage, see *Explosions* (p. B414). Explosive-energy projectiles are also considered incendiary attacks (p. B433).

Low Explosive (LE) (TL4)

This is an exploding shell filled with a low-energy explosive, typically black powder. The explosive makes up 15% or more of the projectile weight. LE rounds were invented in Italy in the late 15th century but not commonly used until the early 19th century.

LE adds a (0.5) armor divisor and a linked crushing explosion with cutting fragmentation. Double CPS. LC1.

Semi-Armor-Piercing Low Explosive (SAPLE) (TL5)

A solid projectile with a modest explosive charge (less than 10% of projectile weight) can be given a time or base fuse so that it will penetrate flesh or a thin-skinned vehicle *before* it explodes, increasing effect; treat as an internal explosion (see *Explosions in Other Environments,* p. B415). SAPLE was introduced for small arms in 1822, but declared illegal for war service against humans in 1868. Use continued in hunting weapons. Military use resumed in WWI.

SAPLE adds a follow-up crushing explosion with cutting fragmentation. Early SAPLE rounds are unreliable; at TL5-6, the round explodes only on a roll of TL-2 or less on 1d. Double CPS. LC1.

Armor-Piercing Explosive (APEX) (TL6)

This is an AP projectile (p. 167) with a *small* high-explosive charge (less than 5% of projectile weight) in the base to enhance behind-armor results; see p. B415 for rules covering internal explosions. APEX is sometimes known as "armor-piercing, secondary effect" (APSE) or "armor-piercing, capped, ballistic cap, high explosive" (APCBC/HE). Introduced in the late 19th century, it saw use mostly in large calibers and in autocannon, and was the main anti-ship – and later, antitank – round until WWII.

Add an armor divisor of (2). Multiply damage by 0.7. If caliber is below 20mm (0.80"), reduce damage type: pi++ becomes pi+, pi+ becomes pi, and pi becomes pi- (no effect on pi-). Add a follow-up crushing explosion with cutting fragmentation. Triple CPS. LC1.

High Explosive (HE) (TL6)

Similar to LE (see left), this ammo uses more powerful high explosive as filler; see *Conventional Explosives* (pp. 183-187) for possibilities. Rounds for naval guns are often called "common shell."

HE adds a (0.5) armor divisor and a linked crushing explosion with cutting fragmentation. Double CPS. LC1.

Semi-Armor-Piercing High Explosive (SAPHE) (TL6)

These projectiles are similar to SAPLE (p. 169), but benefit from more powerful explosives and better fuse reliability. They were introduced for autocannon in the 1910s (for employment against aircraft), and for rifles and MGs in the 1930s (for target observation). Use in small-caliber weapons other than spotting rifles ceased almost completely after WWII, but gimmicky civilian rounds in calibers down to .22 LR occasionally show up even today.

SAPLE adds a follow-up crushing explosion with cutting fragmentation. Double CPS. LC1.

Semi-Armor-Piercing High-Explosive Concussion (SAPHEC) (TL6)

This ammo is essentially SAPHE (above) with thinner projectile walls. The result is a larger explosive payload (around 20% of projectile weight) but limited fragmentation. SAPHEC rounds were developed to give maximum effect *inside* vehicles, first ships and then aircraft; see p. B415 for rules addressing internal explosions.

SAPHEC adds a follow-up crushing explosion. Double CPS. LC1.

Armor-Piercing Hardcore Explosive (APHEX) (TL7)

This combines the enhanced armor penetration of APHC (p. 167) with follow-up explosive and incendiary effects; see p. B415 for details on internal explosions. APHEX sees use mainly in HMGs and autocannon, and is sometimes known as "multi-purpose" (MP).

Add an armor divisor of (2). If caliber is below 20mm (0.80"), reduce damage type: pi++ becomes pi+, pi+ becomes pi, and pi becomes pi- (no effect on pi-). Add a follow-up crushing explosion with cutting fragmentation. Quadruple CPS. LC1.

Explosively Formed Projectile (EFP) (TL7)

Also known as a "self-forging projectile" (SEFOP), this is a shaped-charge munition. However, instead of producing a jet (like a HEAT round, below), it exploits the "Misznay-Schardin effect": the explosive forms the liner into a high-velocity projectile that penetrates armor like a kinetic-energy round. Penetration is inferior to HEAT, but an EFP isn't disrupted by reactive armor. It also has a better stand-off range; while HEAT is only effective if it explodes a few inches or feet in front of armor, an EFP can trigger up to *200 yards* away and still penetrate. It's ideal for top-attack munitions, including artillery shells and overflight antitank missiles. EFP technology was employed in land mines in the 1940s but not used for missile and grenade warheads until the 1990s.

Minimum caliber is 50mm. Change damage type to pi++. Add a (2) armor divisor and a linked crushing explosion. Multiply CPS by eight. LC1.

High-Explosive Antitank (HEAT) (TL7)

A HEAT round launches a shaped charge (pp. 182-183) that has a heavy metal liner (usually made of copper) in the shape of an inverted cone. Upon detonation, this forms a high-pressure, extremely high-velocity gas jet tipped by the molten metal of the liner. The super-hot jet punches through the armor, and both it and armor fragments damage whatever is on the other side. Penetration in armor steel is *deep* – typically 2× to 6× caliber, depending on sophistication and materials – but very narrow (around 10% of caliber). At TL8, penetration increases to 5× to 10× caliber due to more carefully designed and manufactured warheads ("precision shaped charges"), and/or liners made of such high-density metals as tungsten and depleted uranium; this as much as doubles damage. HEAT warheads were introduced in 1939. Since the early 1940s, they've been widely used in all manner of weapons, from grenades to antitank missiles.

Minimum caliber is 20mm. Has a (10) armor divisor and a linked crushing explosion. Triple CPS. LC1.

High-Explosive Dual-Purpose (HEDP) (TL7)

This is a HEAT warhead (above) with enhanced fragmentation, serving as an antitank *and* antipersonnel round. HEDP is used in grenade launchers, and replaces standard HE in certain applications. It's common for tank guns, too, and is sometimes known as "high-explosive antitank, multi-purpose" (HEAT-MP) in this role. HEDP warheads were introduced in the early 1970s.

Minimum caliber is 20mm. Has a (10) armor divisor and a linked crushing explosion with cutting fragmentation. Quadruple CPS. LC1.

High-Explosive Squash-Head (HESH) (TL7)

Also called "high-explosive plastic" (HEP), this is a large plastic-explosive charge inside a thin casing that flattens ("squashes") against armor to cover a larger surface. The delayed explosion sends shockwaves through the armor (usually without actually penetrating it), causing pieces of armor to break off on the *inside* and fly around. This "spall" can damage crew and components. HESH shells were introduced in the 1940s. They're only used in tank guns and recoilless rifles.

Minimum caliber is 50mm. Add a (0.5) armor divisor and a linked crushing explosion. If both kinetic and explosive damage *fail* to penetrate DR, the blast may produce spall on the *opposite* side of the surface struck. This works just like a flat charge (p. 183): it inflicts cutting damage equal to 1/10 the *maximum* explosive damage (as for any contact explosion; see p. B415) resisted by 1/100 the target's DR, rounding up in both cases. These special rules don't apply against laminated armor (p. 229). Triple CPS. LC1.

Example: A Watervliet M40 recoilless rifle (p. 141) hits the turret front of a T-55 tank (DR 560) with a HESH shell. The kinetic impact inflicts 6d×7(0.5) pi++, but the damage roll of 147 points fail to penetrate DR 560 × 2 = DR 1,120. The linked explosion does 8d×5 cr ex, but as even its maximum damage of 240 points is less than DR 560, it, too, fails to penetrate. However, the explosion produces 240/10 = 24 points of spall damage. This is resisted by DR 560/100 = 5.6, which rounds up to DR 6. Crew and components in the turret receive 24 - 6 = 18 points of cutting damage.

Multi-Stage High-Explosive Antitank (MS-HEAT) (TL8)

Sometimes known as "tandem" warheads, MS-HEAT rounds consist of two (or even three!) HEAT charges in a row. The first charge is intended to blow a path through explosive reactive armor, if present, allowing the main charge to attack the armor behind. The diameter of the precursor charge is typically 50-60% that of the main charge. MS-HEAT warheads first appeared in the 1980s. They're widely used in TL8 antitank weapons, including tank cannon, missiles, and rocket launchers.

Minimum caliber is 50mm. Has a (10) armor divisor and a linked crushing explosion. If no explosive reactive armor is present, the charges work as one: add damage together. Multiply CPS by eight. LC1.

Thermobaric (TL8)

Thermobaric warheads detonate aerosol clouds of volumetric slurry explosives (similar to fuel-air explosives, pp. 186-187), such as powdered aluminum. This results in powerful concussion and incendiary effects. Thermobaric ammo became available for man-portable rockets in the late 1970s, for small-arms grenades in the 1990s.

Minimum caliber is 20mm. Add a (0.5) armor divisor and a linked crushing explosion. Blast radius is increased (see *Explosion,* p. B104): divide damage by only (2 × distance in yards from center of blast). Multiply CPS by eight. LC1.

Ejecting-Cargo Projectiles (TL5)

These are hollow warheads filled with a "cargo" that's expelled by a harmless ejection charge, by burning, or simply by breaking apart on impact.

Illumination (TL5)

Also known as "star shell," this projectile – fired at a high trajectory – releases one or more burning flares to provide illumination at night. The flares usually have parachutes to let them stay airborne for longer, and burn with a bright, sharp-edged white light. Within the affected radius, the Vision penalty due to darkness is -3 or the actual penalty, whichever is better. Illumination rounds have been around since the 17th century. At TL8, *IR-illumination* versions appear that emit infrared light only visible to Infravision, Night Vision, and Hyperspectral Vision.

Signal flares are an important subtype. They come in many different colors, and prearranged color codes allow (limited) long-distance communication – they're visible for miles. However, they usually lack parachutes to keep them airborne, and are less useful for illumination: the Vision penalty due to darkness is -5 or the actual penalty, whichever is better.

Minimum caliber is 10mm. All flares get *hot,* inflicting 1d burn per second for 10 seconds on contact (but won't *remain* in contact if fired at someone). Multiply CPS by five. LC4.

Smoke (TL6)

Smoke shells – introduced in 1915 – are intended either to obscure or to mark something. Screening smoke is white, gray, black, or sand-colored, and typically gives -10 to sighting and visually aimed attacks through it (compare Obscure, p. B72). It's also a mild irritant; see *Poison Examples* (p. B439). The cloud takes one second to develop per five yards of burst radius, and typically lingers for 1-4 minutes, depending on weather conditions. Variants include:

Colored Smoke (TL6). Used mainly to mark targets or landing zones, this is still difficult to see through (-7).

Hot Smoke (TL8). Available since 1985, this has the effects of normal smoke and also penalizes Infravision and Hyperspectral Vision.

Prism Smoke (TL8). Introduced in 1988, this acts as hot smoke and also blocks lasers.

Electromagnetic Smoke (TL8). Available from 1994, this works like hot smoke and also affects Radar and Imaging Radar.

Minimum caliber is 10mm. For a cannon round, add an armor divisor of (0.5). For a lower-velocity round (grenade launcher, shotgun, etc.), add an armor divisor of (0.5) and change damage to crushing, with double knockback (pp. B104, B378) if caliber is over 35mm. Add the effects of smoke. Multiply CPS by three. LC3.

Tear Gas (TL6)

Tear gas shells – available from 1915 – release a cloud of one of several irritant chemicals, including such compounds as BA, BZ, CN, CS, and pepper extracts like OC. All are subsumed under the generic term "tear gas." Those exposed must make *two* HT-2 rolls: one to resist coughing (see *Afflictions,* p. B428) and another to resist blindness (p. B124). Effects endure for the time spent in the gas plus minutes equal to the margin of failure. Tear gas is also opaque: Vision rolls suffer -3 per affected yard (to at worst -10, like smoke). See also *Poison Examples* (p. B439).

Tear gas is sometimes mixed with a vomiting agent such as DM or PS. This both incapacitates the target and forces him to remove any gas mask he might have donned after exposure. Those exposed must make a HT-2 roll to resist retching (p. B429). Effects endure for the time spent in the cloud plus five minutes times the margin of failure.

These agents are usually ignited inside the shell. The cloud takes one second to develop per five yards of burst radius, and typically lingers for 1-4 minutes, depending on weather.

Minimum caliber is 10mm. For a cannon round, add an armor divisor of (0.5). For a lower-velocity round (grenade launcher, shotgun, etc.), add an armor divisor of (0.5) and change damage to crushing, with double knockback (pp. B104, B378) if caliber is over 35mm. Add the effects of tear gas. Multiply CPS by three. LC3.

Liquid (TL7)

This is a light plastic or gelatin projectile that ruptures and spills its liquid filler where it hits. It's typically shot from air-powered paintball guns. One paint hit will blind somebody wearing goggles (aim for the eyes) or a visor (face); half a dozen will completely cover a car's windshield – or a tank's main gun sight. Paint is LC4.

Liquid rounds are sometimes used to mark rioters with insoluble, high-visibility paint and/or malodorous fluid. Anyone hit with a scent marker *reeks:* -4 to reaction rolls and +4 to Smell rolls to detect him made by those within four yards. Effects endure for at least an hour – or until after a *very* thorough shower! Such agents are LC2.

Other possibilities include holy water, distilled garlic, alcohol, and contact agents. Corrosives *aren't* an option – they would dissolve the projectile material! LC varies.

Only smoothbores can fire liquid rounds. In addition, such ammo works only in low-powered weapons (in technical terms, those with a muzzle velocity under 500 fps). In a high-powered gun, the projectile would burst under the stress of firing.

Add an armor divisor of (0.2). Halve damage. Damage becomes crushing. Add linked effects based on filler. Divide Range by four. CPS is unchanged. LC depends on filler.

Bursting-Cargo Projectiles (TL6)

These are hollow warheads filled with an area-effect "cargo" that's expelled by a bursting charge. The charge is large enough to do explosive damage (p. B414) and be considered an incendiary attack (p. B433), and ensures that the payload is spread over its effective radius almost instantaneously.

Poison Gas (TL6)

These bursting rounds spread poison gas over their burst radius. Typical fillers are *choking agents,* such as phosgene (CG) and chlorine (CL); *blister agents,* such as mustard gas (common examples are HD and HN) and lewisite (L); and *nerve agents,* such as tabun (GA), sarin (GB), and VX. See *Poison Examples* (p. B439) for representative effects. Choking agents were first synthesized in 1812; blister agents, in 1917; and nerve agents, in 1936. The earliest poison-gas warheads date to 1915.

Minimum caliber is 20mm. Add a (0.5) armor divisor and a follow-up crushing explosion with linked gas effects. CPS depends on filler. LC0.

White Phosphorus (WP) (TL6)

On bursting, this round spreads pieces of white phosphorus (WP) over its burst radius (red phosphorus and triethylaluminum are sometimes used instead). The hot fragments ignite instantly on contact with air and burn anyone they hit. The burning WP also creates a cloud of thick, white smoke almost instantly, but this disperses quickly after the WP stops burning (a minute). Water won't extinguish WP, but if a WP warhead bursts *underwater,* the fragments won't disperse properly and there will be no smoke. WP munitions became available in 1916.

Minimum caliber is 20mm. Add a (0.5) armor divisor and a follow-up *burning* explosion with *burning* fragmentation. Hot fragments (p. B415) do 1d(0.2) burn every 10 seconds for a minute; the victim or an ally must make a successful DX roll to brush away a fragment. Add the effects of smoke. Double CPS. LC1.

Multiple Projectiles

Any smoothbore gun – and many rifled firearms – can fire multiple-projectile loads. Use *Shotguns and Multiple Projectiles* (p. B409) to determine the number of hits. Treat *all* weapons as having Rcl 1 when firing multiple projectiles. For very large numbers of shots, an extended version of the rapid-fire table (p. B373) can be helpful:

Shots	*Bonus to Hit*
2-4	+0
5-8	+1
9-12	+2
13-16	+3
17-24	+4
25-49	+5
50-99	+6
100-199	+7
200-399	+8
400-799	+9
800-1,599	+10
1,600-3,199	+11
3,200-6,399	+12

Loads with high numbers of projectiles will usually score proportionally fewer hits. Realistically, one might expect more hits. However, since each non-crushing hit inflicts a minimum 1 point of damage (see *Damage Roll,* p. B378), these rules ensure that many low-damage projectiles don't hurt more than a few high-damage ones – which *wouldn't* be realistic.

Multiple-Projectile Loads (TL4)

To calculate damage and range for these options, you must know the number of projectiles (NP) the round contains. If you can't find this from real-world sources, estimate: choose a projectile diameter that's no greater than the weapon's caliber; NP typically can't exceed (weapon's caliber/projectile diameter) *cubed,* or 1/40 of this for multiflechette loads. Then use NP to find the NS modifier on this table:

NP	*NS*	*NP*	*NS*	*NP*	*NS*
4	×0.50	50	×0.14	700	×0.038
7	×0.38	75	×0.12	1,000	×0.032
9	×0.33	100	×0.10	1,500	×0.026
12	×0.29	150	×0.082	2,000	×0.022
16	×0.25	200	×0.071	3,000	×0.018
20	×0.22	300	×0.058	5,000	×0.014
25	×0.20	500	×0.045		

If NP falls between two values, use the higher. For greater precision, use NS = 1/(square root of NP).

Example: A 12-gauge (18.5mm) 2.75" shell loaded with 6 Bird shot (pellet diameter 2.79mm) has a maximum NP of (18.5/2.79) cubed, or 291. A typical one-ounce load consists of 223 pellets. Either use NS = 0.058 from the table or calculate it as 1/(square root of 223) = 0.067.

Canister (TL4)

Also known as "langrage" or "grapeshot," a canister load consists of multiple bullets – traditionally, musket balls – held in a basket, canvas bag, or can. It works like a giant shotgun blast (see p. B409) fired from artillery. Bullets for canister are larger than those for small-arms shotshells – typically around 12.7mm, but as large as 51mm (and *not,* as sometimes claimed, miscellaneous scrap, which tends to jam or even burst barrels and breeches). Canister is a late-16th-century innovation. At TL4-5, it's used against close ranks of infantry or sailors; at TL6-8, it's typically intended for tank close-defense. Canister is fired mainly from smoothbore guns, as it eventually ruins rifling.

Minimum caliber is 20mm. Multiply damage by NS. Damage becomes pi+ or pi++, depending on bullet size (see *Bullet Size and Damage,* pp. 162-163). 1/2D is (diameter of bullets in mm) × 5. Max is (diameter of bullets in mm) × 50. Multiply RoF by NP. Rcl becomes 1. CPS is unchanged. LC3.

Shotshell (TL4)

At one time, *all* projectiles – including arrows and sling stones – were called "shot." The term has been reserved for firearms usage since the early 19th century, however, and refers to bullets smaller than bore size, typically loaded in multiples. A shotshell contains a number of small pellets that spread upon leaving the barrel (see p. B409). A smoothbore gun that's normally loaded this way is a "shotgun." Shotloads for rifles are scarce, but smallshot rounds are reasonably common for handguns of 9mm (0.355") and larger, especially revolvers; they're mainly used by civilians for pest control. Non-shotgun chamberings include .38 Special, .44 Russian, .45 ACP, .44-40 Winchester, .56-50 Spencer, and 40×46mmSR (see *Grenade Launcher Ammo,* p. 143).

Minimum caliber is 5mm. Multiply damage by NS. Change damage type and armor divisor as indicated in *Shot Sizes* (see box). 1/2D is (diameter of pellets in mm) × 5. Max is (diameter of pellets in mm) × 100. Put ×NP after RoF. Rcl becomes 1. CPS is unchanged. LC3.

Example: A .45 Colt M1911A1 pistol (see *Colt Government,* pp. 98-99) does 2d pi+. Firing a 105-pellet load of 2.41mm birdshot, as issued in WWII-era survival kits, it would have Dmg 1d-5(0.5) pi-, Range 12/240, RoF 3×105, Rcl 1.

Buck-and-Ball (TL5)

Used primarily in muskets and shotguns, buck-and-ball consists of a full-caliber ball plus two or three smaller buckshot pellets. It's a cheap way to increase power and hit probability in a smoothbore. Common in the muzzleloading era, it's rarely seen in modern cartridge firearms.

Minimum caliber is 10mm (0.40"). The ball does normal damage; the buckshot pellets inflict 1d+1 pi each. Treat as a shotload (see p. B409); the first hit scored is always with the full-caliber ball, while any further hits are with buckshot. Multiply Range by 0.9 for the full-bore bullet. 1/2D for the buckshot pellets is (diameter in mm) × 5; Max is (diameter in mm) × 100. Put ×NP after RoF. Rcl becomes 1. CPS is unchanged. LC3.

Shrapnel (TL5)

Also known as "case shot," this thin-cased shell is filled with large-caliber musket balls (typically around 12.7mm) and has a small bursting charge in the tail. It scatters the balls in a directional spray forward and downwards – ideal for attacking entrenched troops. See also *Airburst* (pp. 174-175). Named after Henry Shrapnel in 1784, it was first issued for service with the British in 1804, and was a standard artillery round from 1815 until WWI, when HE (p. 169) replaced it.

See the weapon descriptions for specifications. Shrapnel has a Maximum Range at which it explodes, but no 1/2D. Double CPS. LC1.

Multi-Ball (TL6)

Multi-ball rounds increase the chance of a hit by throwing more bullets at the target – similar to a shotshell, but with only a few full-caliber projectiles. A *duplex* round contains two slugs, stacked head-to-tail; a *triplex* round has three. These are lighter than the weapon's usual bullets, with reduced damage and range. Multi-ball rounds see occasional use in revolvers and bolt-action rifles starting at TL6, and in automatic rifles and machine guns as of TL7.

Multiply damage by 0.85 for a duplex load, by 0.7 for a triplex load. Divide Range by two for a duplex load, by three for a triplex load. Put ×2 after RoF for a duplex load, ×3 for a triplex load. Rcl becomes 1. Multiply CPS by 1.5. LC3.

Example: A .38 Special revolver does 2d pi and has Range 110/1,200. Firing a triplex load, it would have Dmg 1d+1 pi, Range 35/400, RoF 3×3, Rcl 1.

Beehive (TL7)

Beehive is similar to shrapnel (see left), but filled with thousands of finned steel darts called *flechettes*. It can be set to burst at the muzzle or in steps of 100 yards out to its maximum range. The explosion propels the flechettes forward in a cone, like a shotload. See also *Airburst* (pp. 174-175). The stress of the explosion and impact causes the darts to bend and/or hit sideways, resulting in cutting damage – not small piercing damage, as one might expect. Introduced in 1965 for tank guns, recoilless rifles, and light artillery, beehive replaced canister (pp. 172-173) in the close-defense role.

See the weapon descriptions for specifications. Beehive has a Maximum Range at which it explodes, but no 1/2D. Multiply CPS by five. LC1.

Shot Sizes

In game terms, the typical shot sizes used in shotshells fall into three categories:

Buckshot: A handful of pellets, for combat and big game. Pellet size varies from 8.13mm (0 Buck) to 9.5mm (0000 Buck). The most popular load is 00 Buck, using 8.38mm pellets; shotguns described in ***GURPS*** fire 00 Buck unless noted otherwise. Buckshot does *piercing* (pi) damage.

Birdshot: Dozens or even hundreds of small pellets, for hunting birds and small game. Pellet size varies from 2.03mm (9 Bird) to 7.62mm (1 Buck). Fowl hunters often use 3.3mm (4 Bird); some combat loads use 6.1mm (4 Buck). Birdshot does *small piercing* (pi-) damage and has a (0.5) armor divisor. Treat DR 0 as DR 1 (see p. B379).

Smallshot: Many hundreds of tiny pellets, for target shooting, pest control, and less-than-lethal riot loads. Size varies between 1.02mm (Dust) and 1.78mm (10 Bird). Smallshot does *small piercing* (pi-) damage and has a (0.2) armor divisor. Treat DR 0 as DR 1.

Handloading and Reloading

Handloading (mating bullet and filled cartridge case by hand) ensures that the ammunition is to the shooter's exact specifications – useful when producing match-grade (p. 165) or extra-powerful (p. 165) ammo, or when designing a new round (a so-called "wildcat" round). *Reloading* cuts ammo costs by refilling fired cartridge cases. These procedures are specifically for *cased* ammunition, and require the Armoury (Small Arms) skill and suitable tools:

- At TL5+, a reloading press with dies, powder scale, gauges, etc., can load up to 20 rounds an hour. Roll vs. Armoury hourly. $100, 2 lbs. LC4.
- At TL6+, a progressive reloading machine allows speeds of up to 1,000 rounds an hour. Roll vs. Armoury every 30 minutes. $500, 10 lbs. LC4.
- At TL7+, power-operated machines increase this to 5,000+ rounds an hour. Roll vs. Armoury every 30 minutes. $1,000, 20 lbs., external power. LC4.

Tools come with dies for *one* specific caliber. Dies for additional calibers cost $30 per set.

Developing a handloaded match-grade round requires these tools plus suitable raw materials: cartridge cases, precision bullets, primers, loose propellant, etc. Matching the load to a specific gun involves a day's work, an Armoury roll, *and* an IQ-based Guns roll. Success on both rolls finds the specifications of a perfect match: multiply Acc by 1.5 (not by 1.25, as for a factory-made match-grade round) and drop fractions; maximum Acc bonus is +2 (not +1). Failure on either roll wastes time and materials. On a critical failure on either roll, see *Explosion* (p. B407)! Actually loading the rounds works as described above, but the maximum rate is 20 rounds per hour. Raw materials cost equals the round's usual CPS; see *Ammunition Tables* (pp. 175-177).

Example: An Accuracy International AWM sniper rifle (p. 118) has Acc 6. For perfectly matched handloads, Acc 6 × 1.5 = 9 – but since this is +3 Acc while the limit is +2, final Acc is 8.

Reloading requires the same tools, the cleaned and resized cases, and the round's other components. Materials cost is only *half* the usual CPS. The periodic Armoury rolls are at +2. Critical success reduces loading time for that batch by 25%. Critical failure lowers the batch's Malf. (at the GM's discretion, a round could explode during the loading process!).

Some reloaders cast their own bullets from lead alloys and other easily worked metals (for *unusual* materials, see *Exotic Bullets,* p. 168). Those with suitable tools and knowledge can even make such complex projectiles as hollow-point, AP, APHC, frangible, and multi-ball at home. This requires an Armoury roll, modified as the GM sees fit; e.g., a batch of jacketed bullets might require a roll at -1 (or at -3 if using silver), while APHC might call for a roll at -2. Flechettes for SAPFSDS or MF loads require precision machining and aren't easily manufactured outside of an ammunition factory.

Multi-Flechette (MF) (TL7)

A multi-flechette round is similar to a shotshell (p. 173), but replaces the pellets with finned flechettes around 2-3mm in diameter. MF ammo is available only for low-powered, large-bore weapons. Experiments involving shotguns and grenade launchers go back to the 1950s, but the sole large-scale small-arms application to date is the 40×53mmSR automatic grenade-launcher round the U.S. Army adopted in 2001 (see *Saco MK 19 MOD 3,* p. 143).

Minimum caliber is 10mm. Multiply damage by NS. Change damage type to pi-. 1/2D is (flechette diameter in mm) × 50. Max is (flechette diameter in mm) × 600. Put ×NP after RoF. Rcl becomes 1. Multiply CPS by four. LC3.

Rubber Shot (TL7)

This round replaces the metal pellets of a shotshell (p. 173) with large rubber balls, for use against rioters.

Minimum caliber is 10mm. Multiply damage by NS. Change damage type to crushing. Add an armor divisor of (0.2). 1/2D is (diameter of balls in mm) × 2, Max is (diameter of balls in mm) × 10. Put ×NP after RoF. Rcl becomes 1. Double CPS. LC3.

Annular Blast Fragmentation (ABF) (TL8)

This projectile follows the basic layout of shrapnel (p. 173): a high-explosive charge in the tail and a load of heavy metal pellets or rods in the tip. The fuse detonates the shell about 10 yards from the target (usually by means of a tiny radar or laser), propelling the projectiles forward in a cone. See also *Airburst* (see below). ABF rounds were designed to destroy such aerial targets as aircraft, drones, and missiles, but can also be used like shrapnel, to attack infantry from above. The main applications are missile warheads and autocannon rounds.

See the weapon descriptions for specifications. Multiply CPS by five. LC1.

Projectile Upgrades

These add-ons allow certain types of projectiles to benefit from various special effects.

Airburst (-AB) (TL5)

An "airburst" warhead is fused to detonate in the air over an area of ground or close to a flying target. It follows the rules under *Attacking an Area* (p. B414). At TL5-6, this upgrade typically means a complicated time fuse that gives +3 (*not* +4) to the attack roll – or only +1 if the target is flying. At TL7-8, proximity fuses with tiny radars (TL7) or lasers (TL8) enjoy the full +4. In all cases, use the square of the margin of failure to determine scatter distance on a miss; see *Scatter* (p. B414).

This upgrade is most common for HE, leading to "HE-AB." Such rounds inflict only fragmentation damage – typically in a cone in the direction of the shot. When used for indirect fire, apply the rules for airbursts (see p. B415): the fragments rain down from

above, negating penalties to hit crouching, kneeling, sitting, and prone targets, and bypassing any cover that isn't overhead.

Multiply CPS by 1.5. Shrapnel, beehive, and ABF *already* include this option at no extra cost.

Incendiary (I) (TL5)

A solid bullet can have a small amount of incendiary material (such as saltpeter or white phosphorus) inside. Such a projectile is likely to ignite fuel, ammo, and volatile gases – and even flammable vehicles. Incendiary rounds were invented in 1834 (TL5), and quickly adapted for rifles and muskets in Europe; they weren't normally available for handguns, however. In the 1930s (late TL6), full-caliber AP and APHC rounds were sometimes given an incendiary element, resulting in "API" and "APHCI." Such combination munitions replace basic incendiary ammo at TL7.

Add the incendiary (inc) damage modifier (pp. B105, B433). Multiply CPS by 1.5.

Self-Destruct (-SD) (TL6)

Any explosive projectile or warhead from late TL6 on can have a fuse that destroys it after it reaches a certain distance – usually 1/2D range. The intent is to avoid endangering friendly forces. This upgrade appears mainly on autocannon rounds, especially those employed for air-to-air combat and antiaircraft fire.

Multiply CPS by 1.5.

Tracer (-T) (TL6)

Tracer rounds, introduced in 1917, contain a flammable element in the base of the projectile. This ignites upon firing, making the bullet's path visible as a bright streak. In poor lighting conditions, squad leaders often use tracers to indicate to their troops where to fire. Almost any projectile can have a tracer element, leading to such ammo types as "APDS-T" and "SAPHE-T." There are even multiple-projectile loads that include a tracing element.

Tracers burn out at 1/2D range. Within that range, they function as incendiary attacks, and make it easier to observe and correct automatic weapons fire (on any turn immediately after a long burst of automatic fire, the shooter may add a non-cumulative +1 to skill). Firing tracers also gives away the firer's position, however. At TL7-8, it's possible to avoid this by using *dark-ignition tracers,* which travel 100+ yards before they ignite, or *dim tracers,* which emit infrared light that's only visible to Infravision, Night Vision, and Hyperspectral Vision.

Add the incendiary (inc) damage modifier (pp. B105, B433). Multiply CPS by 1.5.

Ammunition Tables

Ammunition for the firearms in ***High-Tech*** is spread across several tables, one per closely related class of weapons. Rounds appear in ascending order by (metric) caliber, with the following information:

Name: The round's common name(s).

WPS: Weight per shot for a *cased* round with a *solid* projectile, unless noted otherwise. Modern small-arms ammo is typically packed in cartons of 50 pistol rounds, 20 rifle rounds, 25 shotgun shells, or 2-5 large-bore hunting rounds. Larger quantities come in metal cans; e.g., a 31-lb. can with 840 rounds of 5.56×45mm.

Weights for *loaded* magazines, belts, etc., appear in the weapon tables. Weights of *empty* magazines vary widely. Some general guidelines:

- SMG and rifle magazines (steel): about 0.5 lb.
- Pistol magazines (steel): about 0.25 lb.
- Charger clips: about 0.01 lb.
- Non-disintegrating MG belts: 0.5-1 lb. per 100 rounds for typical rifle calibers.
- Disintegrating belt links: 1 lb. per 100 rounds for rifle calibers; 3-5 lbs. per 100 for heavy MGs.

Powder and shot are *heavy* in bulk. Gunpowder usually comes in 100-lb. kegs. A 70-lb. keg holds about 10,000 flints, while 10,000 percussion caps in a wooden box weigh 12.5 lbs.

CPS: Cost per shot for a *cased* round with a *solid* projectile, except as noted. See *Projectile Options* (pp. 166-167) for cost multipliers for other projectiles, and *Ammunition Upgrades* (p. 165) and *Projectile Upgrades* (pp. 174-175) for additional cost multipliers. CPS assumes good-quality ammo in small lots. Reduce total cost by 5% if buying 500 or more rounds at once, by 15% if buying 5,000 or more rounds. An Area Knowledge roll for the region where you're shopping – Area Knowledge (Net), for purchases made over the Internet – will find somebody selling ammo at a 5% discount; critical success finds a 15% discount. Military-surplus ammo can often be had at considerable savings.

Notes: Footnotes on deviations from the above assumptions.

Handguns, Submachine Guns, and Personal Defense Weapons

Name	*WPS*	*CPS*	*Notes*
4.6×30mm Royal Ordnance	0.013	$0.4	
.22 Short (5.6×11mmR)	0.0054	$0.05	
5.7×28mm Fabrique Nationale	0.013	$0.4	
.25 ACP (6.35×16mmSR Browning)	0.012	$0.1	
.28 Caplock (Colt Number 1)	0.006	$0.1	[1]
7.62×25mm Tokarev	0.024	$0.2	
7.62×39mmR Nagant	0.028	$0.2	
7.62×42mm	0.053	$0.5	
7.63×25mm Mauser	0.023	$0.2	
.32 ACP (7.65×17mmSR Browning)	0.018	$0.1	
7.65×21mm Parabellum	0.023	$0.2	
.31 Caplock (Allen)	0.007	$0.1	[1]
8×21mm Nambu	0.025	$0.2	
.380 ACP (9×17mm)	0.021	$0.2	
9×18mm Makarov	0.022	$0.2	
9×19mm Parabellum	0.026	$0.3	
.38 S&W (9×20mmR)	0.035	$0.2	
9×21mm Gyurza	0.024	$0.4	
.357 SIG (9×22mm)	0.029	$0.4	
9×23mm Bergmann-Bayard	0.027	$0.3	
.38 ACP (9×23mmSR)	0.029	$0.2	
.38 Super Auto (9×23mmSR)	0.029	$0.3	
9×25mm Mauser	0.029	$0.4	
.38 Long Colt (9×26mmR)	0.033	$0.2	
.38 Special (9×29mmR)	0.033	$0.3	
.357 Magnum (9×33mmR)	0.035	$0.4	
.36 Caplock (Colt Number 5)	0.014	$0.1	[1]
.36 Caplock (M1851 Navy)	0.023	$0.1	[1]
.41 Short Remington (10×12mmR)	0.025	$0.2	
.40 S&W (10×21mm)	0.035	$0.3	
10×25mm Auto	0.042	$0.6	
.41 Long Colt (10×29mmR)	0.04	$0.2	
.42 Caplock (LeMat)	0.018	$0.2	[1]
.44 Special (10.9×29mmR)	0.047	$0.4	
.44 Magnum (10.9×33mmR)	0.054	$0.7	
.44 American (11×23mmR)	0.043	$0.4	
.44 Russian (11×25mmR)	0.049	$0.4	
.44 Caplock (Deringer)	0.022	$0.2	[1]
.44 Caplock (M1860 Army)	0.023	$0.2	[1]
.44 Caplock (M1848 Dragoon)	0.028	$0.3	[1]
.44 Caplock (M1847 Walker)	0.03	$0.3	[1]
.442 Caplock (Adams)	0.019	$0.2	[1]
.442 RIC (11.2×17mmR)	0.043	$0.4	
.44 Colt (11.25×28mmR)	0.045	$0.4	
.45 Flintlock (Wogdon)	0.023	$0.2	[1]
.45 GAP (11.43×19mm)	0.045	$0.5	
.45 ACP (11.43×23mm)	0.047	$0.5	
.45 S&W (11.43×28mmR)	0.045	$0.5	
.45 Long Colt (11.43×33mmR)	0.05	$0.5	
.454 Casull (11.43×35mmR)	0.066	$1	
.455 Webley (11.5×19mmR)	0.05	$0.5	
12×16mm Lefaucheux	0.05	$0.5	
.450 Adams (12.05×17mmR)	0.045	$0.3	
.476 Enfield (12.05×22mmR)	0.055	$0.5	
.50 Flintlock (Collier)	0.026	$0.3	[1]
.50 Action Express (12.7×33mm)	0.067	$1	
13×36mm Gyrojet	0.03	$7.50	
.54 Caplock (Elgin Cutlass)	0.05	$0.4	[1]
.56 Flintlock (Tower Sea Service)	0.05	$0.4	[1]
17.1mm Flintlock (AN IX)	0.076	$0.4	[1]
.68 Paintball	0.0068	$0.05	[2]
.75 Flintlock (Rigby)	0.075	$0.5	[1]

Shotguns

Name	*WPS*	*CPS*	*Notes*
.410 2.5" (10.4×63mmR)	0.04	$0.4	[3, 4]
.410 3" (10.4×76mmR)	0.05	$0.4	[3, 4]
32-gauge 2.75" (12.5×70mmR)	0.06	$0.4	[3, 4]
20-gauge Caplock	0.075	$0.4	[1, 4]
20-gauge 2.5" (15.6×63mmR)	0.07	$0.4	[3, 4]
20-gauge 2.75" (15.6×70mmR)	0.08	$0.4	[3, 4]
16-gauge Flintlock	0.085	$0.5	[1, 4]
16-gauge 2.75" (16.8×70mmR)	0.09	$0.4	[3, 4]
12-gauge 2.5" (18.5×63mmR)	0.1	$0.5	[3, 4]
12-gauge 2.75" (18.5×70mmR)	0.11	$0.5	[3, 4]
12-gauge 2.75" (18.5×70mmR)	0.13	$0.7	[4]
12-gauge 3" (18.5×76mmR)	0.18	$0.7	[3, 4]
11-gauge Flintlock	0.12	$0.5	[1, 4]
10-gauge 2.875" (19.7×73mmR)	0.15	$1.3	[3, 4]

Muskets, Rifles, and Machine Guns

Name	*WPS*	*CPS*	*Notes*
.175 BB	0.0008	$0.003	[2]
4.73×33mm Dynamit-Nobel	0.011	$0.5	[5]
5.45×39mm	0.023	$0.4	
.223 Remington	0.026	$0.5	
5.56×45mm NATO	0.027	$0.5	
.220 Swift (5.56×56mmR)	0.033	$1	
5.6×57mmB	0.016	$1	[6]
5.66×39mm	0.062	$2	[7]
.22 Long Rifle (5.7×16mmR)	0.0077	$0.1	
5.7×26mm Usel	0.011	$0.4	[5]
5.8×42mm	0.028	$0.5	
6×60mm Lee (.236 Navy)	0.044	$0.8	
6.5×50mmSR Arisaka	0.046	$0.8	
6.5×52mm Mannlicher-Carcano	0.049	$0.8	
6.5×53mmR Dutch Mannlicher	0.049	$0.8	
6.5×55mm Mauser	0.053	$0.8	
7×57mm Mauser	0.054	$0.8	
7×64mmB Remington Magnum	0.062	$1.5	
.280 Remington (7×65mm Express)	0.054	$1	
7.5×54mm MAS	0.053	$0.8	
.30 M1 Carbine (7.62×33mm)	0.029	$0.4	
7.62×39mm	0.036	$0.6	
.30-30 Winchester (7.62×51mmR)	0.047	$0.8	
7.62×51mm NATO (.308 Winchester)	0.056	$0.8	
.30 Remington (7.62×52mm)	0.044	$0.8	
7.62×54mmR Mosin-Nagant	0.05	$0.8	
.30-40 Krag (7.62×59mmR)	0.059	$0.8	
.30-06 Springfield (7.62×63mm)	0.056	$0.8	
.300 Winchester Magnum (7.62×66mmB)	0.068	$1.5	
.300 Remington Ultra Magnum (7.62×72mmRB)	0.075	$2	
7.65×53mm Mauser	0.053	$0.8	
.303 British (7.7×56mmR)	0.055	$0.8	
7.7×58mm Arisaka	0.049	$0.8	
7.7×58mmSR Arisaka	0.061	$0.8	
.32 Long Rifle (7.92×24mmR)	0.022	$0.2	
.32-20 Winchester (7.92×33mmR)	0.027	$0.4	
7.92×33mm Kurz	0.037	$0.6	
7.92×57mm Mauser	0.059	$0.8	
8×50mmR Lebel	0.061	$0.8	
8×50mmR Mannlicher	0.062	$0.8	
8×58mmR Krag	0.064	$0.8	
8×60mm Mauser	0.055	$0.8	

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Muskets, Rifles, and Machine Guns (Continued)

Name	WPS	CPS	Notes
8×63mm Bofors	0.064	$1	
.338 Lapua Magnum (8.6×70mm)	0.096	$3.50	
.35 Remington (8.9×49mm)	0.052	$0.8	
9×39mm	0.051	$0.5	
9.3×74mmR	0.074	$2	
.375 H&H Magnum (9.35×72mmB)	0.086	$2.50	
.38 Volcanic	0.015	$0.25	
.38-40 Winchester (10×33mmR)	0.04	$0.8	
.40-90 Sharps (10.2×67mmR)	0.09	$1.5	
.44 Henry (10.7×22mmR)	0.045	$0.4	
10.75×58mmR Berdan	0.088	$1	
10.75×68mm Mauser	0.088	$1.5	
.44-40 Winchester (10.8×33mmR)	0.043	$0.6	
.444 Marlin (10.9×57mmR)	0.052	$1.5	
11mm Syringe	0.02	$15	[2]
11.15×58mmR (.43 Spanish Remington)	0.092	$1	
.44-90 Remington Special (11.2×62mmR)	0.11	$2.8	
.44-90 Sharps (11.3×61mmR)	0.11	$2.8	
11.4×50mmR (.43 Egyptian Remington)	0.094	$1	
.45 Flintlock (Kentucky)	0.025	$0.3	[1]
.45-75 Winchester (11.43×48mmR)	0.085	$1	
.45-55 Springfield (11.43×53mmR)	0.08	$0.9	
.45-70 Springfield (11.43×53mmR)	0.086	$1	
.450 Martini-Henry (11.43×59mmR)	0.11	$1	
.450 Gardner-Gatling (11.43×63mmR)	0.12	$1.2	
.45-110 Sharps (11.43×73mmR)	0.12	$1.8	
.458 Winchester Magnum (11.63×64mmB)	0.11	$4	
.460 Weatherby Magnum (11.63×74mmB)	0.14	$7.50	
11.75mm Girandoni	0.021	$0.2	[2]
.470 Nitro Express (12×83mmR)	0.12	$10	
.50 Flintlock (North West)	0.035	$0.4	[1]
.50-95 Winchester Express (12.7×49mmR)	0.06	$1.3	
12.7×77mm	0.25	$1.6	
.50 Browning (12.7×99mm)	0.25	$4	
12.7×108mm	0.31	$5	
.50-90 Sharps (12.9×64mmR)	0.11	$1.3	
.50-140 Sharps (12.9×83mmR)	0.15	$1.5	
.56-50 Spencer (13×29mmR)	0.062	$0.6	
.50-70 Government (13×44mmR)	0.086	$1	
13×92mmSR Mauser	0.26	$4.4	
.54 Flintlock (Hall M1819)	0.044	$0.3	[1]
.56-56 Spencer (14×22mmR)	0.073	$0.6	
14.5×114mm	0.44	$6.7	
.577 Caplock (Enfield)	0.086	$0.4	[1]
.577 Snider (14.6×51mmR)	0.1	$0.8	
.58 Berdan (15×44mmR)	0.12	$0.7	
.600 Nitro Express (15.2×76mmR)	0.2	$20	
15.43×54mm Dreyse	0.085	$0.4	[8]
.625 Flintlock (Baker)	0.062	$0.4	[1]
.68 FN	0.019	$1.5	[2]
17.5mm Flintlock (Mle 1777)	0.087	$0.4	[1]
.700 Nitro Express (17.8×89mmR)	0.25	$75	
.75 Flintlock (Brown Bess)	0.09	$0.4	[1]
8-bore (21.2×70mmR)	0.26	$4	

Autocannon and Cannon

Name	WPS	CPS	Notes
20×82mm Mauser	0.45	$8	
20×102mm	0.57	$10	
20×110mmRB Oerlikon	0.54	$10	
20×138mmB Solothurn	0.74	$10	
25×137mm Oerlikon	1.1	$15	
1" Gatling (25.5×97mmR)	0.82	$10	
37×94mmR Hotchkiss	1.4	$16.5	
37×249mmR	2.9	$20	
1.5" Caplock (Greener)	5	$10	[1]
2.5" Caplock (Screw-Gun)	7.4	$11	[1]
75×350mmR	20	$55	
75×495mmR	23	$60	
76.2×539mmR (3")	24	$60	
105×371mmR	40	$75	
106×607mmR	38	$185	
12-pounder Cannonlock	15	$25	[1]
125×408mmR	73	$255	[9]

Grenade Launchers

Name	WPS	CPS	Notes
20×28mm	0.21	$6	[3]
25×59mmB	0.37	$7.50	[3]
1" Flare (25.4×107mmR)	0.2	$1	[3]
26.5×103mmR	0.22	$1	[3]
30×28mmB	0.77	$7	[3]
37×122mmR	0.37	$5	[3]
40mm VOG-25	0.55	$5	[10]
40×46mmSR	0.5	$5	[3]
40×53mmSR	0.75	$7.50	[3]

Mortars

Name	WPS	CPS	Notes
2"2.25	$15	[10]	
52mm	1.7	$15	[10]
60mm	3.2	$20	[10]
3"10	$35	[10]	
81mm	11.7	$35	[10]
82mm	7.4	$25	[10]
120mm	35.2	$60	[10]

Light Antitank Weapons

Name	WPS	CPS	Notes
57×305mmR	5.5	$70	[3]
84×250mmR	5.7	$75	[3]

Notes:

[1] Powder and shot (p. 163).
[2] Air-gun projectile (pp. 88-89).
[3] Light cased (p. 164).
[4] Shotshell (p. 173).
[5] Caseless (pp. 164-165).
[6] SAPFSDS (p. 168).
[7] Underwater dart (p. 169).
[8] Consumable cased (p. 164).
[9] Semi-consumable cased (p. 164).
[10] Mortar shell.

Ammunition Interchangeability

Most firearms can only fire ammunition of *one* specific caliber. Some substitutions are possible, though. For example, any revolver (but *not* a semiautomatic pistol!) chambered for the .44 Magnum round can also fire the shorter .44 Special and .44 Russian – but not vice versa. Similarly, pump-action shotguns chambered for 12-gauge 3" shells can also fire 12-gauge 2.75" shells – but not the other way around.

On the table below, a weapon designed for a particular cartridge can fire the calibers to the *right* of that round on the same line. It can't fire those to the *left* unless the rounds are separated by an equal sign (=), indicating true interchangeability.

7.63×25mm Mauser = 7.62×25mm Tokarev
.357 Magnum > .38 Special
.44 Magnum > .44 Special > .44 Russian = .44 American
.454 Casull > .45 Long Colt > .45 S&W
.476 Enfield > .455 Webley = .450 Adams > .442 RIC
.22 LR > .22 Short
20G 2.75" > 20G 2.5"
12G 3" > 12G 2.75" > 12G 2.5"

The longer round usually won't even fit in a gun intended for the shorter one. If it does, it *might* fire – but the results of attempting to fire it are likely to be a malfunction at best, a catastrophic explosion at worst.

Misloading Table

Roll 3d on an attempt to fire an incompatible round.

3 – Round fires! Use its standard damage and range. Treat Acc as 0. The weapon doesn't jam, but regardless of its type, removing the casing and loading another round takes as long as reloading a break-open weapon (see *Reloading Your Gun,* p. 86).

4 – As **3,** but the weapon jams after firing. Treat as *Stoppage* (p. B407).

5-10 – Round *doesn't* fire and the weapon jams. Treat as *Stoppage.*

11-16 – Round simply doesn't fire. Treat as *Misfire* (p. B407).

17 – Round discharges incorrectly, damaging the gun. Treat as *Mechanical or Electrical Problem* (p. B407), but repairs take at least a day and require 1d×10% of the weapon's price in parts.

18 – Round discharges incorrectly, bursting the weapon! Treat as *Explosion* (p. B407), regardless of TL.

Liquid Projectors

A "liquid projector" is any weapon that dispenses a liquid in a stream or a mist. At TL6, this usually means a flamethrower or a powerful water hose. At TL7-8, other possibilities include aerosol dispensers intended for personal defense and water cannon used for riot control. At TL8, incendiary projectile launchers like the Buck HAFLA (p. 142) and RPO-Z (see *KBP RPO-A Shmel,* p. 149) supplant flamethrowers, offering superior range and fewer drawbacks.

Flamethrowers

At TL6, flamethrowers appear that use a compressed gas such as nitrogen to propel an oil-based liquid through a tube. Normally, the fuel is ignited as it leaves the weapon – although many models can also fire "cold shots," drenching an area in unlighted fuel that can be set aflame later. Flamethrowers soon become popular for bunker-clearing and house-to-house fighting (and for battling sci-fi and horror creatures that are immune to firearms!). At TL7, flamethrowers employ thickened fuel for increased range. They can use unthickened fuel – e.g., plain gasoline – but this halves Range.

Effects: Anyone hit by a flamethrower suffers large-area injury (p. B400). The fuel continues to burn for 2d×5 seconds (1d×5, beyond 1/2D), inflicting 1d burn per second. Unsealed DR protects at 1/5 value; sealed armor protects completely. See also *Catching Fire* (p. B434).

A flamethrower can be played over an area up to three yards wide as an All-Out Attack. Roll separately to hit each target. Divide damage and burn duration by the width of the area (round *down*). For instance, an All-Out Attack (Jet) on two men in a three-yard area requires two attack rolls. Each victim suffers 1/3 damage, and then 1d burn per second for (2d×5)/3 seconds.

Flamethrowers Table

See pp. B268-271 for an explanation of the statistics.

LIQUID PROJECTOR (FLAMETHROWER) (DX-4 or other Liquid Projector-4)

TL	Weapon	Damage	Range	Weight	RoF	Shots	ST	Bulk	Cost	LC	Notes
6	Fiedler Kleif	3d burn	15/20	68	Jet	1×20s	11†	-8	$1,500	1	[1]
7	TOZ ROKS-2	3d burn	25/40	50	Jet	10×1s	10†	-7	$2,000	1	[1]
7	Beattie M2-2	3d burn	25/40	72	Jet	5×2s	11†	-8	$1,800	1	[1]
7	DWM FmW46	3d burn	25/40	7.8	Jet	1×1s	6†	-4	$500	1	[1, 2]
7	TOZ LPO-50	3d burn	50/75	51	Jet	3×3s	10B†	-7	$2,500	1	[1]

Notes:

[1] Takes two Ready maneuvers to prepare for firing.

[2] Sling swivels (p. 154).

If a vehicle with an air-breathing engine is hit in a vital area (p. B554), it must make a HT roll to avoid a breakdown. It may also catch fire. Roll again every three seconds until the fuel burns out.

Flamethrowers often strike fear into their intended targets. The GM may require a Fright Check (p. B360) – or penalize one made for other reasons – for those who face these weapons.

Drawbacks: Flamethrower damage has almost no penetrating power on cover; even a sheet of plywood will deflect the burning fuel. If the stream is kept on the cover, it might catch fire – but those behind it will have time to retreat or shoot back. One can bounce the jet off obstacles to reach *behind* cover, however.

If using *Malfunctions* (p. B407), roll 3d when a malfunction occurs:

3-5 – No ignition. The target is sprayed with fuel, which can be ignited later, but there's no flame. Each attempt to solve the problem requires 10 seconds and an Armoury (Small Arms) or IQ-based Liquid Projector roll. Success returns the weapon to action, failure allows another attempt, and critical failure means an explosion, as **18.**

6-17 – No fuel is sprayed. To solve the problem, use the rules given for **3-5.**

18 – Explosion! Everything within two yards of the firer suffers the equivalent of one second's damage.

Flamethrowers may also explode if struck by a bullet or a fragment . . . and they *do* tend to attract enemy fire. An attack on an exposed weapon is at no penalty, but an attack on a backpack model is at -4 if the carrier is facing the attacker. If any damage penetrates the flamethrower's DR 2, roll 1d. On a 1, the device explodes, as above. Any other result means it's simply disabled.

Fiedler Kleif (Germany, 1912-1917)

The *Kleinflammenwerfer* ("small flamethrower") was the first modern flamethrower, and ideal for taking out strongpoints in trenches. By 1916, most WWI combatants had similar weapons. The Kleif had a single ignition cap, and fired its entire 4.2 gallons of unthickened fuel in one 20-second stream.

TOZ ROKS-2 (Russia, 1941-1942)

During WWII, the Red Army used the *Rantseviy Ognemyot Klyueva-Sergeeva-2* ("Klyuev's and Sergeev's backpack flamethrower"). Its flame-gun looked like a rifle and its rectangular tank resembled a backpack. This was to deceive the enemy into letting it into range (make a Vision roll to identify it) . . . even though most soldiers don't allow *any* hostile within 40 yards, regardless of his armament! The tank held 2.6 gallons and the flame-gun used 7.62×25mm blanks in a revolving 10-round cylinder for ignition, giving 10 one-second bursts.

Beattie M2-2 (USA, 1942-1945)

This flamethrower was standard for the U.S. military until the 1950s. Some 25,000 were made. Most nations had something similar during WWII. The tank held 4.75 gallons of thickened fuel and the flame-gun used blank cartridges in a revolving five-round cylinder for ignition, giving five two-second bursts or one 10-second stream.

The similar GE *M9A1-7* (1956-1969) superseded the M2-2 and saw use in the Vietnam War: Range 35/55, Wt. 52. Two of these appear as part of the armory of the Antarctica Research Station in *The Thing.* The U.S. removed all flamethrowers from service in 1978.

The POA-CWS *M3-4-3* (1944-1945) had the same performance as the M2-2, but was installed in some M4 Sherman tanks (p. 239) in the place of the bow MG (and 12 main gun rounds). It fed from a 25-gallon tank – enough for a 45-second stream or 10 five-second bursts. Some 1,784 were made and used in WWII and the Korean War.

Dirty Tech: Improvised Flamethrowers

Flamethrowers are highly effective against certain enemies but nearly unobtainable outside the military – and even an army might not have any! A popular improvisation involves just a lighter and a spray can of flammable, pressurized liquid. Many hair sprays, spray paints, aerosol cleansers, and self-defense sprays (see *Spray Guns and Aerosols,* p. 180) will work, as will a liquor bottle with a spray cap.

A makeshift flamethrower has Dmg 1d-2 burn and Range 1. It gives 1-5 seconds of flame, depending on container size. Few improvised fuels burn for more than 1-2 seconds *on* the victim. Malf. is 14; a malfunction usually means the flame fizzles out.

DWM FmW46 (Germany, 1944-1945)

The *Einstoss-Flammenwerfer 46* ("single-burst flamethrower model 46") was a disposable weapon resembling a fire extinguisher with a pistol grip. The operator tucked the bottle under one arm, pointed it at the enemy, and unleashed a single burst of flame. It was intended for parachutists and other assault troops. Some 30,900 were made.

TOZ LPO-50 (Russia, 1967-1975)

The Soviet *Lekkiy Piekhotnyy Ognemyot-50* ("light infantry flamethrower") contains 2.6 gallons of fuel – enough for three three-second bursts. Batteries (4×S) activate the three ignition cartridges. The flame-gun has a bipod. The LPO-50 was copied in China.

We had . . . a pair of military flame-throwers of the sort used in the World War, in case it proved partly material and susceptible of mechanical destruction . . .

– H.P. Lovecraft, "The Shunned House"

Spray Guns and Aerosols

These weapons squirt liquids and gases, typically in less-than-lethal personal-defense and riot-control applications. Most must hit the face (-5) to be effective, but the wide jet grants the same +2 to hit accorded to blowpipe-delivered powders (p. B180).

Tear Gas Spray (TL7)

This is an aerosol spray canister that dispenses any of several agents commonly called "tear gas" (see *Tear Gas,* p. 171). Treat it as a melee weapon with Reach 1, 2, not as a ranged attack; speed/range penalties don't apply. The victim must make *two* HT-2 rolls: one to resist coughing (see *Afflictions,* p. B428) and another to resist blindness (p. B124). Both effects endure for minutes equal to the margin of failure.

Tear gas sprays come in many sizes. The canister in the table is small enough to carry in a coat pocket or a purse. Dispensers are sometimes incorporated into other devices, notably flashlights (pp. 51-52) and batons (see *Clubs,* p. 198). One-shot models can even be concealed in items as small as wristwatches (p. 31).

Pepper Spray (TL8)

Similar to tear gas spray (above), this dispenser uses a pepper solution that's more effective than most chemical agents – especially in cold weather, against animals, and on people who are emotionally disturbed or on drugs. The victim must make *two* HT-4 rolls: one to resist coughing (see *Afflictions,* p. B428) and another to resist blindness (p. B124). Both effects endure until the solution is removed with lots of water and towels.

Squirt Carbine (TL8)

This is a powerful toy water gun charged with compressed air by pumping the action like a shotgun. Filling the two-pint water tank takes 10 seconds; removing the tank and replacing it with a spare takes only two Ready maneuvers. After that, pressurizing the firing chamber takes *another* five seconds. A larger version with an interchangeable *15*-pint backpack tank has Range 12, Wt. 18/15, Shots 15, and Cost $45, and takes 10 seconds to pressurize.

Possible loads include water (regular or holy), water-soluble paint, malodorous fluid (see *Liquid,* pp. 171-172), alcohol, and distilled garlic. Undead-hunters will find the film *From Dusk Till Dawn* inspirational. Acids and other corrosives *won't* work, as they'll quickly eat through the gun's toy-grade plastic.

Effects depend on the liquid. Handle paint, alcohol, etc., using *Liquids in the Face* (p. B405). Water is merely distracting – halve the penalties given there to -1. Paint will *blind* those wearing goggles (eyes) or a visor (face) until it's wiped off (takes three Ready maneuvers) or the protective gear is removed.

Spray Guns and Aerosols Table

See pp. B268-271 for an explanation of the statistics.

LIQUID PROJECTOR (SPRAYER) (DX-4 or other Liquid Projector-4)

TL	Weapon	Damage	Range	Weight	RoF	Shots	ST	Bulk	Cost	LC	Notes
7	Tear Gas Spray		Special	1, 2	0.1	Jet	20	3	-1	$10	4
8	Pepper Spray		Special	1, 2	0.1	Jet	20	3	-1	$10	4

LIQUID PROJECTOR (SQUIRT GUN) (DX-4 or other Liquid Projector-4)

TL	Weapon	Damage	Range	Weight	RoF	Shots	ST	Bulk	Cost	LC	Notes	
8	Squirt Carbine		Special	8	3.5/2	Jet	2	4†	-3	$30	4	[1]

Notes:

[1] Sling swivels (p. 154).

Laser Weapons

At TL8, laser technology yields the first beam weapons. All fielded designs are for use against optics – including the human eye. Technical difficulties keep *lethal* laser weapons experimental at best.

A *laser dazzler* is a low-powered laser that temporarily blinds people and optical sensors. It's intended for personal defense and riot control. It emits a Vision-based affliction in a cone; see *Area and Spreading Attacks* (p. B413). Only those looking in the laser's direction are affected. Victims must make a HT-5 roll to resist; those beyond 1/2D get +3 on their roll. DR has no effect, but Protected Vision (p. B78) gives +5 and Nictitating Membrane (p. B71) confers +1/level – and anti-laser goggles (p. 71) grant both. Failure means blindness (p. B124) for minutes equal to the margin of failure.

A *blinding laser* is a medium-powered laser that fries optics and permanently blinds people. It delivers a Vision-based affliction in a fairly narrow beam aimed at a single target – but this is still broad enough that the gunner need not specifically target the eyes (no penalty for hit location). The victim must be looking toward the laser to be affected. He gets a HT-10 roll to resist, modified as above: +3 beyond 1/2D, +5 for Protected Vision, and +1/level for Nictitating Membrane. Failure inflicts *crippling* blindness; see *Duration of Crippling Injuries* (p. B422), and remember that failure by 10+ is a critical failure (p. B348).

NORINCO ZM87 (China, 1995-2000)

The ZM87 was a tripod-mounted blinding laser. It was offered for export in the mid-1990s but banned by the United Nations Protocol on Blinding Laser Weapons. Only 22 are thought to have been made.

NORINCO QXJ04 (China, 2004-)

The *04 Shi Jiguang Xuanmu Qiang* ("laser dazzler gun type 04") looks like a bulky bullpup rifle. It has a 1-lb. 3× scope (+1 Acc) for aiming and a removable battery pack instead of a magazine. It uses a green laser beam. The Chinese police adopted it in 2004.

Laser Weapons Table

See pp. B268-271 for an explanation of the statistics.

BEAM WEAPONS (PROJECTOR) (DX-4 or other Beam Weapons-4)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
8	NORINCO QXJ04	HT-5 aff	6+1	1,500/4,500	12/M	1	100(3)	8†	-4	1	$15,000	3	3-yard cone

GUNNER (BEAMS) (DX-4 or other Gunner-4)

TL	Weapon	Damage	Acc	Range	Empty Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
8	NORINCO ZM87	HT-10 aff	18	3,600/11,000	77/VL	5	1,000(5)	17M	-8	1	$50,000	1	

Explosives and Incendiaries

Since the introduction of gunpowder at TL3, mankind has continued to develop more and better ways to blow up things – and his fellow man. For basic rules for explosives, see *Explosions* (pp. B414-415). Fans of gritty realism may enjoy these *optional* rules.

Explosions in Enclosed Spaces

The shockwave from an explosion that occurs within a room or a vehicle may reflect off the walls and deliver all of its energy to those unfortunate enough to be inside. When an explosion occurs in an enclosed space, calculate the crushing or burning damage that would reach the boundaries. If this is more than 2 points, but not enough to burst the walls, then the blast is *contained.* Anyone in the area takes double damage – or 1.5× damage if there are doors and windows, which will blow out and relieve some of the pressure. Anyone *behind* a rupturing door or window automatically takes fragmentation damage (p. B414).

Side Effects of Explosions

Explosions cause several unpleasant effects besides basic crushing or burning damage and possible fragmentation.

Concussion and Deafness

Except in a vacuum, explosives cause destruction at a distance via a wave of high-pressure air. This is potentially injurious to hearing. Anyone who suffers crushing damage from an explosion must roll vs. HT.

Modifiers: -1 per 5 points of crushing damage penetrating the DR of a vehicle or armor; +1 for ordinary earplugs, or +5 for Protected Hearing (p. B78) – either natural or from high-quality earmuffs (see *Ear Protection,* p. 70).

Failure means the victim suffers tinnitus that gives a Hearing penalty equal to his margin of failure. Failure by 10+, or critical failure, causes deafness. Either effect lasts (20 - HT) minutes, minimum one minute. After that, roll vs. HT each turn to recover. Critical failure on a recovery roll indicates a permanent injury (see *Duration of Crippling Injuries,* p. B422): Hard of Hearing (p. B138) if the penalty was -1 to -9, Deafness (p. B129) if total deafness occurred. *Exception:* Duration is only two seconds with Protected Hearing, and recovery is automatic.

Any failure on the initial HT roll also stuns the victim. Roll vs. HT each turn to recover.

Flash and Blindness

Explosives release some of their energy as a blinding flash of light. Those looking toward a blast must roll vs. HT if crushing or burning damage was rolled against them, even if they suffer *no* injury.

Modifiers: -1 per 10 points of crushing or burning damage received, regardless of whether it penetrated DR; +1 for sunglasses or a tinted windshield, +3 for welding goggles, or +5 for Protected Vision (p. B78) – either natural or from antiglare goggles (see *Eye Protection,* pp. 70-71).

Failure means the victim is dazzled and suffers a Vision penalty equal to his margin of failure. Failure by 10+, or critical failure, causes blindness. These effects last (20 - HT) minutes, minimum one minute. After that, roll vs. HT each turn to recover. Critical failure on a recovery roll indicates a permanent injury: Bad Sight (p. B123) if the penalty was -1 to -9, Blindness (p. B124) if total blindness occurred. *Exception:* Duration is only two seconds with Protected Vision, and recovery is automatic.

Any failure on the initial HT roll also stuns the victim. Roll vs. HT each turn to recover.

Explosive Destruction of Materiel

The primary use of explosives is to *blow things up!* The following rules expand on *Demolition* (p. B415). They're intended to help the GM determine the amount of explosives that PCs must carry to accomplish demolition missions.

The guidelines below indicate the weight of explosives (in pounds) required to destroy various objects. They assume TNT, except as noted. To find the necessary weight of an explosive other than the one named, calculate weight as described, multiply by the listed explosive's REF, and divide by the substitute explosive's REF. See the *Relative Explosive Force Table* (p. 183) for REF values.

Well-tamped explosives have about twice the shattering power of untamped ones. Unless the description notes that tamping is *required,* a demolition expert can use it to increase effectiveness. Boring a hole in an object and packing in explosives *halves* the weight of explosives needed to destroy it.

Charges that meet these specifications – adjusted for substitutions and tamping – have the desired effect on a successful Explosives (Demolition) roll; see p. B194. Improvised materials may give a penalty. Failure always does *some* damage to the object. Critical failure usually means no explosion, but anything can happen (GM's decision) – explosives are unpredictable!

- *To breach a wall with a mine, or blow a crater:* The explosive *must* be tightly packed in a hole in the ground. To breach a wall, this means in a tunnel under the wall (the original meaning of "mine," although the name was later applied to the explosive charge). Then use:

300 × distance to surface in feet = required weight of black powder (REF 0.5) in lbs.

This gives a crater as deep as the distance to the surface and six times that distance in diameter.

- *To shatter timbers, such as bridge timbers, gates, or trees:* Using the diameter of a round timber or the least dimension of a dressed one as "thickness," if the explosives can be placed in holes bored in the timber, use:

0.004 × (thickness of timber in inches) squared = required weight of TNT (REF 1) in lbs.

If the explosives are looped like a necklace around the timber (detonation cord works best), use:

0.025 × (thickness of timber in inches) squared = required weight of TNT (REF 1) in lbs.

- *To break iron girders, such as bridge girders:* Wrap the charges completely around the girder, and use:

0.5 × cross-sectional area of girder in square inches = required weight of TNT (REF 1) in lbs.

- *To blow a hole in a wall:* For a brick wall, use:

0.5 × diameter of desired hole in feet × (thickness of wall in feet) squared = required weight of TNT (REF 1) in lbs.

For reinforced concrete, the first factor is 1 instead of 0.5.

- *To blow a hole in a metal plate:* For an iron plate, use:

2 × diameter of desired hole in feet × (thickness of plate in inches) squared = required weight of TNT (REF 1) in lbs.

For *steel* plate, the first factor is 2.5 instead of 2.

Shaped Charges

A conical cavity in an explosive charge can focus the blast, greatly increasing breaching power. Mining engineers *might* have known about this phenomenon in the late 18th century, but it's named the "Munroe effect" after Dr. Charles

Relative Explosive Force Table

This table expands on that on p. B415. See *Conventional Explosives* (pp. 183-187) for descriptions.

TL	Type	REF	Description
3	Serpentine Powder	0.3	Propellant
4	Ammonium Nitrate (AN)	0.4	Demolition explosive
4	Corned Powder	0.4	Propellant
5	Improved Black Powder	0.5	Propellant
5	Mercury Fulminate	0.5	Detonator
6	Lead Azide	0.4	Detonator
6	Blasting Gelatin (60%)	0.8	Demolition explosive (NG)
6	Smokeless Powder/Cordite	0.8	Propellant
6	Picric Acid (PA)/Lyddite	0.9	Warhead filler
6	TNT	1.0	Warhead filler
6	Amatol 80/20	1.2	Warhead filler (AN/TNT)
6	Dynamite (80%)	1.2	Demolition explosive (NG)
6	Nitrocellulose (NC)/Guncotton	1.3	Propellant
6	Tetryl	1.3	Detonator
6	Torpex	1.3	Warhead filler for underwater use (RDX/TNT)
6	Nitroglycerin (NG)	1.5	Demolition explosive
6	RDX/Hexogen/Cyclonite	1.6	Warhead filler
6	PETN	1.7	Detonating cord filler
7	ANFO	0.5	Demolition explosive (AN)
7	Military Dynamite	0.9	Demolition explosive (RDX/TNT)
7	Pentolite	1.3	Warhead filler (PETN/TNT)
7	Composition A	1.4	Warhead filler (RDX)
7	Composition B/Cyclotol	1.4	Warhead filler (RDX/TNT)
7	Composition C/PE1	1.4	Plastic explosive (RDX)
7	Composition C4	1.4	Plastic explosive (RDX/Tetryl)
7	Semtex-H	1.4	Plastic explosive (RDX/PETN)
7	HBX	1.5	Warhead filler for underwater use (RDX/TNT)
7	Octol	1.5	Warhead filler (HMX/TNT)
7	PBXN-5	1.6	Warhead filler (HMX)
7	HMX/Octogen	1.7	Warhead filler
7	Fuel-Air Explosive	5	Demolition explosive (Ethylene Oxide)
8	Liquid Explosive Foam	1.1	Demolition explosive (Nitromethane)
8	Demex	1.4	Extrudable explosive (RDX)
8	LX14	1.6	Warhead filler (HMX)
8	Thermobaric Composite	2	Demolition explosive
8	CL20	2.3	Warhead filler

Munroe, who first demonstrated it in 1888. It remained a scientific curiosity until the late 1930s. A charge that capitalizes on this effect is termed a "shaped charge" – or sometimes a "hollow charge."

If using Explosives/TL6 (Demolition), roll at -4 to remember this effect, and then at -5 to create a home-made shaped charge. Success gives a charge that will blow a hole in a wall (see above) with *half* the usual amount of explosive – identical in effect to tamping, but not cumulative with it. Failure simply means the charge doesn't do the job. Those with Explosives/TL7-8 (Demolition) know how to set shaped charges; roll just once, at no penalty.

A shaped charge with a metal liner will produce a narrow – usually less than 1" – hole in armor. Properly fused for time and standoff distance, it receives an armor divisor of (10). Antitank weapons have employed such charges since early TL7; see *High-Explosive Antitank (HEAT)* (p. 170).

Flat Charges

Where a shaped charge focuses an explosive blast on a small point, a "flat" or "pancake" charge does the opposite, creating a broad shock front to shake apart the target without (necessarily) opening a breach. If the damage roll fails to penetrate DR, divide it by 10 and apply it to 1/100 the target's DR. Damage type becomes *cutting.* Setting flat charges requires no special knowledge, but they only see use in warheads from TL7; see *High-Explosive Squash-Head (HESH)* (p. 170).

Conventional Explosives

These important explosives are described in approximately the order in which they became available. Tech levels correspond to the start of widespread *use,* not to the date of *invention.*

Black Powder (TL3)

"Black powder" is a 20th-century term for the sole explosive and propellant in general use before the late 19th century. Prior to that time, it was the *only* powder used in guns, and called simply "gunpowder." All black powder is a mixture of saltpeter (potassium nitrate), charcoal, and sulfur; see *Home-Cooked Explosives* (p. 186).

Exactly when gunpowder was invented is unknown. In writings dating to about 1240, Roger Bacon – an English Franciscan monk – described how to make it and that it would explode. He wrote in a cipher that wasn't broken for more than 600 years, though, and didn't claim to have *invented* gunpowder. A Chinese text claims that the "Spear of Vehement Fire" – a sort of Roman-candle incendiary – was first used in 1259. An Arab manuscript from 1304 depicts something that *might* be a cannon: an arrow, surrounded by smoke and flames, apparently emerging from a tube of some sort.

The earliest gunpowder was *serpentine powder* (TL3), also called "meal powder." This was less powerful than later powder and tended to separate in storage or travel. It was used for artillery until the late 16th century. To keep it from separating, it was often hauled to the battlefield as ingredients and mixed on-site. Having to blend an unstable explosive under enemy fire, surrounded by burning matches or lit braziers, may explain the devotion of gunners to Saint Barbara, their patron saint!

Early in the 16th century, *corned powder* (TL4) was invented. Meal powder was dampened and pressed into cakes, which were dried and ground into grains of various sizes. Corned powder didn't separate in storage or transport – a huge advantage. As well, varying the grain size made it possible to adjust the burn rate: fine-grained powder was used for small arms and for priming (which needed a fast rate), while coarse powder was superior for large-bore weapons and as a blasting explosive.

These practices eventually led to a grading system – introduced in France in the 18th century – in which FG was the coarsest grade, FFG was one grade finer, and so on. Such standardization came with further advances in production, which made it possible to maximize power. The *improved black powder* (TL5) assumed in the remainder of this discussion and throughout ***High-Tech*** is about as good as black powder can get.

Historically, military gunpowder was packed in kegs holding 100 lbs. (6d×14 cr ex damage if it explodes). Two powder kegs made a convenient load for a mule or a pack horse. The usual charge for a flintlock musket was 100 to 200 grains; thus, at 7,000 grains to the pound, a mule-load of powder gave 7,000 to 14,000 musket shots! Smaller amounts were typically packed in 4-lb. cans (4d×4 cr ex).

A pound of improved black powder – enough for 35 to 70 musket shots – does 4d×2 cr ex damage. $5 per pound. LC3.

Nitroglycerin (TL6)

In 1846, Ascanio Sobrero of Italy invented *nitroglycerin* (NG): a colorless liquid explosive. Swedish chemist Alfred Nobel perfected the process of making it in the 1860s. It was exported worldwide under the name "Swedish Blasting Oil."

Nitroglycerin is powerful and not difficult to manufacture if sufficient care is taken (it involves mixing glycerin with nitric and sulfuric acids). Nobel insisted that it was so safe that the routine precautions developed for gunpowder were unnecessary. This proved not to be the case. Nitroglycerin is extremely sensitive to shock and thus tricky to transport. It's inert when frozen (at 50°F), so in the late 19th century, manufacturers froze it for shipment – but thawing it is dangerous in itself!

Whenever nitroglycerin is dropped or otherwise shocked, roll 3d. On 12+, it explodes. Impure nitro can be even more dangerous – some compounds explode on 10+!

A pound of nitroglycerin does 5d×3 cr ex damage. It commonly comes in 4-oz. vials (7d+1 cr ex). $15 per pound. LC2.

> *I had recovered enough in a week to send to Albany for a gang of men to blow up the Martense mansion and the entire top of Tempest Mountain with dynamite, stop up all the discoverable mound-burrows, and destroy certain over-nourished trees whose very existence seemed an insult to sanity.*
>
> *– H.P. Lovecraft, "The Lurking Fear"*

Dynamite (TL6)

Dynamite was invented in 1867 to circumvent the problems of nitroglycerin. It consists of nitroglycerin soaked into a stabilizing material, such as kieselguhr (diatomaceous earth) or sawdust, to make it more difficult to detonate. It's so safe that it won't explode if set on fire. (It burns beautifully, too.) Dynamite must be detonated by the shock of an explosion – typically by a blasting cap that is itself set off electrically or by a burning fuse.

Despite its safety, dynamite initially faced heavy regulations – some of which amounted to prohibitions on shipping nitroglycerin at all – in many places. In the U.S., matters were further complicated by the absence of domestic manufacturers and an active dislike of the substance by the explosives industry. Nevertheless, there was a demand: dynamite could move more rock than black powder, and was safer to handle. From the late 1860s to the mid-1870s, there was an active black market in the stuff. Armed men with bulging suitcases roamed the mining and quarrying districts, at odds with the law, the explosives trust, and each other. By the 1870s, dynamite was being produced in America and the regulations had changed to allow legal transportation . . . but it was lively while it lasted.

One practical problem *does* enliven the use of dynamite, especially illegal use or transportation: old dynamite "sweats" – that is, the nitroglycerin oozes out of the carrier.

Sweating dynamite is just as dangerous as nitro! If the PCs encounter old dynamite, the GM should decide what number, on 3d, sets it off if shocked. Guessing this number merely by looking requires a successful Explosives (Demolition) roll.

The REF of dynamite depends on its nitroglycerin content. This ranges from 20% to 80%, giving REF 0.3 to 1.2. Dynamite is named after its nitro percentage; e.g., "80% dynamite" is dynamite with 80% nitro. Note that so-called "military dynamite" (TL7) *doesn't* contain nitroglycerin – it's a mix of high explosives in "stick" form, equivalent in strength to 60% dynamite.

Dynamite commonly comes in 0.5-lb. sticks, which are about 1.25" in diameter and 8" long (Holdout -2). A 0.5-lb. stick of 80% dynamite does 9d+1 cr ex damage. $10 per pound. LC2.

Smokeless Powders (TL6)

In 1845, Christian Schönbein of Switzerland developed *nitrocellulose* (NC) or "guncotton." In 1885, French chemist Paul Vieille produced the earliest "single-base powder" by combining nitrocellulose with moderators to make it burn more slowly. This was also the first successful "smokeless powder"; the French adopted a rifle that fired smokeless ammunition in 1886 (see *Lebel Mle 1886,* p. 111). In 1887, Swedish chemist Alfred Nobel invented "double-base powder," which used a blend of nitrocellulose and nitroglycerin (p. 184). Almost all smokeless powders developed since have been of one of these two types.

There are many different smokeless powders, each with a specific purpose. The results of simply substituting one formula for another by weight or by bulk would range from embarrassing to disastrous. British and American writers often refer to *all* such propellants as "cordite." In fact, Cordite was a particular class of double-base powders used in English sporting and military ammunition from the 1890s to about the 1960s.

Smokeless powders aren't *entirely* smokeless, but they produce so much less smoke than black powder that the name has stuck. They almost never fill the entire cartridge case . . . a .38 Special case completely filled with some mixtures would shatter the gun! However, they aren't normally explosive – you can't blow a bridge with the contents of a few thousand cartridges. They *do* burn fiercely, though, and can be used to start fires even on wet wood.

Typical smokeless powders cost $7.50 per pound. LC3.

TNT (TL6)

The high explosive *trinitrotoluene* (TNT) was invented in 1876 and saw wide use as a demolition explosive and warhead filler throughout TL6. Its prevalence made it the benchmark against which the concussive power of all other explosives was measured: relative explosive force (REF) is a comparison to TNT, which has an arbitrary REF of 1. TNT was still used for demolition during WWII, common packaging including the German army's 0.45-lb. blocks (4d×2 cr ex) and the U.S. military's 1-lb. blocks (6d×2 cr ex). $10 per pound. LC2.

Dirty Tech: Skimming Nitro

Nitroglycerin had been on the market about one full day when someone figured out how to blow a safe with it. About a day after that, the police realized that anybody buying nitro was a suspect. The underworld soon learned that nitro could be extracted by boiling dynamite, which was more easily acquired, and skimming the nitro off the top – hence "soup" as the slang term for nitroglycerin.

This operation is *dangerous*. It requires a Chemistry-2 or Explosives (Demolition)-2 roll. Failure by 1 simply ruins the dynamite. Failure by 2 blows up half its weight. Any greater failure blows it all up; the worse the failure, the closer the "expert" was to the explosion.

During the first half of the 20th century, the classic way to blow a safe door was to put putty around the door-crack, pour in the soup, and hit the safe with a sledgehammer. Professional safe-blowers – called "yeggs" – usually had bad hearing and shaky nerves . . . They were also unpopular company, possibly due to their habit of carrying around impure and very unstable explosives.

One method of carrying nitro was to inject it into a rubber ball about the size of a baseball (which would hold eight ounces and do 5d×2 cr ex) and sling the ball by a string under the shirt. It wasn't safe to body-punch a yegg! Anyone carrying nitro in this fashion must make a DX roll whenever he falls, is hit, suffers a car accident, and so on. Success means he cushioned the explosive safely. Failure . . . R.I.P.

Nitro might be carried in much larger quantities for some purposes. An illegal cache of old, sweating dynamite might be the equivalent of several *pounds* of nitro. This much explosive could level a building or turn a vehicle to confetti!

Plastic Explosives (TL7)

Plastic explosives – also called "plastique" – consist of high explosives mixed with binding agents ("plasticized") to make them pliable. Their texture is similar to plastic putty, allowing them to be cut and formed to shape. They're also extremely stable, only exploding if set off by a detonator or another explosion. These factors make plastic explosives easy to work with and highly effective – they account for the majority of special-ops demolition jobs and well-planned terrorist bombings.

Nobel's Explosive Number 808, a green-colored British innovation used in WWII, was the first modern plastic explosive. Another British creation widely used during WWII was the grayish PE1 (also "Composition C"), which appeared in 1939. C4 (or "Composition C4"), the whitish explosive featured in countless action movies, is a U.S. innovation dating to 1948. The orange-colored Semtex-H, infamously used in many terrorist bombings, came out of Czechoslovakia in 1967. There are many other examples!

Dirty Tech: Home-Cooked Explosives

Home-made explosives are often dangerous and illegal, but sometimes an adventurer's only option!

Making Black Powder

Black powder is easy to make, once the secret is known – but there's no particular reason why anyone would mix the ingredients and touch a match to them. A society might never discover this basic explosive. H. Beam Piper's *Lord Kalvan of Otherwhen* stories explore just this possibility: Calvin Morrison, thrust into an alternate world, knew how to make gunpowder, and his life soon became very interesting indeed.

Black powder is a mixture of saltpeter (potassium nitrate), charcoal, and sulfur. Saltpeter is a white, crystalline substance, found under well-aged manure piles – of which no medieval society has a shortage. Charcoal is easily gotten by burning wood. Sulfur may be found as deposits of pale-yellow crystals, and can also be obtained by evaporating the water from foul-smelling sulfur springs. A typical blend is 75% saltpeter, 15% charcoal, and 10% sulfur. Early gunpowder generally contained less saltpeter, which reduced its power.

Layering sulfur, charcoal, and saltpeter does not an explosive make! The constituents must be ground finely and combined in the right proportions. Producing black powder requires the ingredients, a few basic tools (mainly storage containers, and a mortar and pestle for grinding), and a successful Explosives (Demolition), Explosives (Fireworks)+4, or Chemistry+4 roll. Success yields *meal powder* or *serpentine*. Dampening this, pressing it into cakes, and drying and grinding the cakes (carefully – don't strike a spark!) gives *corned powder*. See also *Black Powder* (pp. 183-184).

Making Plastic Explosives

Producing home-made plastic explosives requires $50 in raw materials per pound, 12 hours' work, and a Chemistry or Explosives (Demolition) roll. Failure means the plastique is unstable (-4 to all Explosives rolls to *use* the stuff), weak (halve damage), smelly (detected on an unmodified Smell roll), and/or inert (simply won't blow up). Critical failure detonates the whole batch for full damage! See also *Plastic Explosives* (pp. 185-186).

Making ANFO

Most explosives improvised from cheap and easily available materials are of the ammonium nitrate/fuel oil (ANFO) type, and concocted from such things as fertilizers, bleaching agents, and diesel fuel. Make a Farming or Streetwise roll to obtain these ingredients, which cost $2 per pound. Roll against Chemistry+4 or Explosives (Demolition)+4 to mix them correctly. Actually blowing the stuff up requires a further Explosives (Demolition)+2 roll. See also *ANFO* (see right).

Most plastic explosives are odorless – although Nobel's No. 808 has a distinct almond smell – and emit a low level of fumes (nitrogen compounds). This makes them difficult (-8) for chemical detectors (pp. 48-49) or trained sniffer dogs to find, unlike most other explosives. They're also impossible for X-ray machines (pp. 206-207, 217) to detect unless specially treated – which some commercially available mixtures are, to discourage illegal use. Plastique has a long shelf-life (at least 10-20 years), and thus can be stored in caches until required.

World War II-era plastique usually came in wax paper-covered 0.25-lb. blocks (7d cr ex). Modern military C4 comes in 1.25-lb. blocks (5d×3 cr ex) sheathed in olive plastic, with a self-adhesive sticky side for placement. A chewing-gum stick of plastic explosive, as seen in *Mission Impossible,* would do 1d+1 cr ex – *if* you managed to detonate it. $30 per pound. LC2.

ANFO (TL7)

"ANFO" stands for "ammonium nitrate/fuel oil." More generally, it refers to any explosive mixture of an oxidizing agent – such as ammonium nitrate (found in fertilizer), calcium nitrate, or ammonium perchlorate (used in bleaching agents) – with a liquid fuel, usually diesel (possibly mixed with vegetable oil). The ratio varies according to the ingredients and desired results, but is typically about 94% oxidizer to 6% fuel.

ANFO-type explosives, commercially available from 1955, are used in mining and account for 97% of the industrial explosives used in the U.S., as well as many major terrorist acts (including the truck bomb that destroyed the Alfred P. Murrah Federal Building in Oklahoma City, Oklahoma). They have many disadvantages – they're low-powered, highly water-absorbent, and easily detected (by their smell, fumes, and size). However, they're stable and relatively easy to put together; see *Home-Cooked Explosives* (see box). They need a blasting cap and a booster charge (a small amount of high explosive) to set off.

One pound of ANFO does 4d×2 cr ex. Ingredients cost $2 per pound. LC3.

Fuel-Air Explosives (TL7)

Fuel-air explosive (FAE) munitions were developed in the late 1960s as a way to generate large, non-nuclear explosions. The principle was known long before that – in WWII, the Germans considered using an FAE (finely powdered coal dust) to attack Allied bomber formations, but couldn't solve the problems of spreading and igniting the fuel. Practical considerations aside, the *theory* is simple: release a volatile mixture of pressurized fuels such as ethylene oxide, propylene oxide, and methylacetylene, allow it to disperse over the desired area (which takes fractions of a second), and ignite it.

In general, FAEs are five times as powerful (REF 5) as an equivalent weight of TNT (REF 1). Some military theorists have warned against the battlefield use of large FAE munitions, because their explosive power is so great that the opposition might believe that nuclear

devices had been used and respond in kind! FAE bombs were first used in combat in Vietnam.

Constructing a homemade FAE requires appropriate materials, eight hours' work, and a Chemistry-3 roll followed by an Explosives (Demolition)-4 roll. Any failure means the device won't function. Critical failure results in a life-threatening catastrophe. Success can be devastating, however – the fuel-enhanced truck bomb used against the U.S. Marine Corps headquarters in Beirut in 1983 was equivalent to 12,000 lbs. of TNT (6d×220 cr ex).

A FAE explosion has an increased blast radius (see *Explosion,* p. B104): divide damage by only (2 × distance in yards from center of blast). LC1.

Extrudable Explosive (TL8)

Extrudable explosive (plasticized RDX) looks like green toothpaste. It comes in caulking-gun cartridges and small plastic tubes. Used to fill hard-to-reach places, it's handy for blowing open doors, safes, etc. Roll against Explosives (Demolition) to apply it properly. Detonating it requires a blasting cap or other explosion.

A 0.1-lb. blob of extrudable explosive does 4d+2 cr ex damage; use *maximum* damage for objects in contact with it (see p. B415). A caulking-gun cartridge is $40, 1.1 lb., and holds 1 lb. of explosive (7d×2 cr ex); a caulking gun is $5, 0.5 lb. A small "toothpaste tube" is $10, 0.3 lb., and holds 0.25 lb. of explosive (7d cr ex). LC2.

Foam Explosive (TL8)

Foam explosive (*nitromethane*) comes as a liquid in an aerosol dispensing can, and has the appearance and consistency of white shaving cream. Developed during the 1980s for destroying land mines, it's designed to cling to an object and deliver a powerful shock to its weakest part. Foam explosive has low explosive power for its volume, making it ideal for opening doors, car trunks, etc., in situations where stronger measures would draw unwelcome attention or endanger the user. Make an Explosives (Demolition) roll to apply it properly. Detonating it requires a blasting cap or other explosion.

A 0.1-lb. blob of foam does 4d cr ex damage; apply the *maximum* to objects in contact with it (see p. B415). An aerosol can is $10, 1 lb., and holds 0.9 lb. of explosive (6d×2 cr ex). LC2.

Explosives Equipment

Fortunately, *most* explosives are stable enough that special equipment is needed to detonate them.

Time Fuse (TL3)

At TL3-5, a time fuse, or "match," is a cord impregnated with flammable material – usually a nitrate solution or spirits of wine (alcohol distilled from wine). At TL6-8, it's a cord with a black-powder core. Match comes in two varieties:

Slow-match is primarily a way to carry fire until it's needed. It burns at 4" per hour. It's used to fire matchlock guns, to light grenades, to set off cannon, and as the slow element in a fuse train.

Quick-match is used principally as a time fuse. Various formulas burn at rates from 1' per minute to 4 yards per minute. (An open powder train – that is, a line of powder poured on the ground – also burns at about 4 yards/minute.)

To make or evaluate a fuse, or to set one to go off at a predetermined time, roll vs. Explosives (Demolition or Fireworks). A 15' length of either type of match is $10, 1 lb. LC3.

Blasting Caps (TL5)

Blasting caps, invented in 1863, are used to detonate explosive charges. Non-electric caps are ignited by an ordinary 7.5' time fuse (burns for one minute per 1.5'). Electric caps attach to a blasting machine via integral 30' wires. Each cap does 1d-2 cr ex on its own. For six: $10, 0.25 lb. LC2.

Blasting Machines (TL5)

Blasting machines (also called "exploders") produce the electric current that detonates electric blasting caps.

Early Blasting Machine (TL5). A heavy, boxy device with a T-shaped handle. Pushing down the plunger detonates up to 20 electric blasting caps at once. $30, 10 lbs. LC3.

Military Blasting Machine (TL7). A modern military blasting machine – often called "clacker," after the sound it makes – is cell phone-sized and generates enough electric current (usually by twisting its handles a few times) to detonate up to 50 electric blasting caps at once. $50, 0.75 lb. LC3.

Remote Blasting Machine (TL8). A radio transmitter for detonating electric blasting caps up to five miles away. It comes in a briefcase, which holds the transmitter and 10 receivers. Each receiver can set off up to 15 electric blasting caps at once. $500, 10 lbs., 4×S/14 days. LC3.

Detonating Cord (TL6)

Also called "det cord" and "primacord," this is a "rope" consisting of a PETN core sealed in tape, wrapped with yarn, and sheathed in plastic. When ignited, it detonates at over 6,000 yards per second – much faster than sound, and effectively instantaneous to human senses. It's intended primarily for linking detonators with explosives, and for connecting multiple charges for simultaneous detonation. Other applications are mine-clearing, cutting girders and trees, and laying booby traps. The military uses it extensively.

A pound of detonating cord does 5d×2 cr ex damage. Many thicknesses are available. The standard military type has a diameter of 0.2", and a pound is about 55.5' long; it usually comes as a 500' roll of 9 lbs. of cord, which weighs 11.7 lbs. with spool. One foot weighs 0.018 lb. and does 1d+2 cr ex; one yard weighs 0.054 lb. and does 2d+2 cr ex. Det cord wrapped around something to cut it inflicts *maximum* damage on the object (roll damage normally for those nearby). $100 per pound. LC2.

Time Clocks (TL6)

Precision timepieces are sometimes used to trigger explosives. A blasting cap (p. 187) is wired to the clock, which is then set. It can be stopped, reset, or tripped manually. Typical designs are waterproof to 20'.

Mechanical Clock (TL6). Time delay can vary from 15 minutes to 12 hours. $25, 1 lb. LC4.

Electronic Clock (TL7). There's no specific limit on delay – an electronic clock can count down for a *long* time. $25, 0.5 lb. LC4.

Time Pencils (TL6)

A "time pencil" consists of a pencil-shaped metal tube containing a thin wire and an ampoule of corrosive liquid. Crimping the tube crushes the ampoule, which starts the corrosive eating through the wire. When the wire finally breaks, it snaps a percussion cap that sets off any fuse or explosive attached. Special-ops soldiers and saboteurs made extensive use of such detonators during WWII.

Various models have delays of 10 minutes, 30 minutes, two hours, five hours, 12 hours, and 24 hours. Temperature variations cause the exact time of detonation to fluctuate; for instance, a temperature above 60°F reduces time by 20-50%. Make an Explosives (Demolition) roll to select the version needed for the situation and to determine the approximate time of detonation. A six-pack – one of each type – is $30, 0.25 lb. LC2.

Cutting Cord (TL7)

Also known as a "flexible linear shaped charge," this is an angular lead "rope" with a high-explosive core. The inverted-V shape causes the explosive to function as a shaped charge (pp. 182-183) that can cut through doors, walls, etc. Special-ops forces and SWAT teams often use cutting cord for forced entry; combat engineers employ it for various demolition tasks.

A 2' length of standard cutting cord weighs 1 lb. This does 4d×2 cr ex damage to anyone nearby – but against the item it's supposed to cut, use 4d(5) cr ex and apply *maximum* damage. It usually comes as a 20' roll of 10 lbs. of cord, which weighs 15 lbs. with spool. $90 per pound. LC2.

INCENDIARIES

Against some targets, fire is more effective than explosions. See *Flame* (pp. B433-434) for basic rules that apply to all incendiaries.

Thermite (TL6)

Thermite is a powdered aluminum/ferrous oxide mixture used for welding and for sabotage. When heated to the combustion point of the aluminum via a special igniter, the components react vigorously and develop great heat (over 4,000°F). This reaction is almost impossible to contain – it cuts *through* steel, ignites nearby flammables, burns underwater (water *won't* extinguish it), and streams molten metal.

Burning thermite does 3d burn damage per second to anything it touches. Every 10 points of damage also reduces DR by 1 permanently, even on armor; in effect, DR *at that specific point* is considered semi-ablative against the attack (compare p. B559). Sparks and radiated heat inflict 3 points of burning damage per second in a one-yard radius, dropping to 1 point per second at two yards, but don't destroy DR. Thermite burns for about 25 seconds a pound. $40 per pound, often cheaper in bulk. LC3.

White Phosphorus (TL6)

White phosphorus, while a potent incendiary, relies on a bursting charge for its famous hot fragments and instant smokescreen; it isn't used alone. For its effects as a bursting warhead, see *White Phosphorus (WP)* (p. 172). LC1.

Napalm (TL7)

Napalm – also called "jellied gasoline" – is a mixture of roughly 90% gasoline and 10% aluminum soaps (aluminum *na*phthenate and aluminum *palm*itate, whence "napalm"). The U.S. developed it in 1942 and employed it extensively from 1944. An improved formula uses 21% gasoline, 33% benzene, and 46% polystyrene. A United Nations convention of 1980 declared napalm illegal, but the U.S. didn't sign it.

Napalm is mainly used in incendiary bombs. It's enclosed with phosphorus as an igniter. When the casing is cracked, the phosphorus ignites on contact with air and sets the napalm aflame. The napalm spreads out evenly, and can penetrate into earthworks and bunkers.

Napalm sticks to whatever it hits and burns for at least a minute, although fires started in the area of effect might burn for considerably longer. It inflicts 1d-1 burn damage per second over the area, like ordinary flame. However, burning napalm can't be extinguished by anything less than complete immersion in water or burial under lots of earth (which won't help the victim). As well, it consumes the oxygen in its immediate area, threatening even those protected against the flame with asphyxiation.

Land Mines Table

See pp. B268-271 for an explanation of the statistics.

EXPLOSIVES (DEMOLITION)+4, SOLDIER, or TRAPS+2

TL	*Weapon*	*Damage*	*Weight*	*Holdout*	*Cost*	*LC*	*Notes*
6	TMi35	5d×8 cr ex	19	-4	$130	1	
7	OZM-3	5d [4d] cr ex	7	-3	$60	1	
7	M18A1 Claymore	6d×3 cr ex	3.5	-3	$50	1	[1]
8	M86 PDM	8d [2d] cr ex	1.2	-2	$45	1	

Notes:

[1] Fires a multiple-projectile attack (p. B409) to the front: Dmg 2d(0.5) pi-, Range 55/270, RoF 1×700, Rcl 1.

Napalm is easy to make, requiring a Chemistry+3 or Explosives (Demolition)+3 roll and simple materials: gasoline and something to gel it. Packing peanuts, liquid soap, melted animal fat, and many other common materials will suffice. Orange-juice concentrate won't . . . LC1.

Land Mines

Land mines are emplaced explosives for use against infantry and vehicles. Crude mines were employed in some 19th-century wars (TL5), while purpose-built mines saw use in WWI (TL6). In the decades since, *millions* of mines have been buried worldwide.

To place ready-to-use mines, roll against Explosives (Demolition)+4, Soldier, or Traps+2. Improvised mines – often rigged from artillery shells – are a favorite of guerrillas. Roll vs. Explosives (Demolition)-2 to set up such a device.

A mine might be triggered by pressure, contact, a tripwire, a magnetic sensor, or even a remote detonator. A metal detector (pp. 50, 206) will find some buried mines, but TL7-8 devices are often made of undetectable plastic or wood. Dogs and rats can be trained to sniff for the explosives. Probing the ground with a knife or a stick will locate a mine on an Explosives (EOD) or Soldier-5 roll. *Disarming* it requires an Explosives (EOD) roll – and many mines feature anti-tamper devices that give a penalty.

Tellermine 35 (Germany, 1935-1943)

The *Tellermine 35* ("plate mine model 1935") was the standard German antitank mine of WWII. It was a disc-shaped device, 1' in diameter, with a carrying handle. Its pressure fuse required at least 220 lbs. to activate. The TMi35 sometimes had an anti-lifting fuse, too (-2 on attempts to remove it, with any failure meaning detonation). Similar designs are still made in various places today.

OZM-3 (Russia, 1950-1965)

The OZM-3 resembled a soup can with a fuse assembly on top. The fuse was usually connected to a tripwire, which required 15 lbs. to activate. When tripped, the mine hurled a grenade that exploded 5' above the ground, scattering fragments to the sides. (Immediately dropping to the ground – see *Dodge and Drop,* p. B377 – avoids the fragmentation damage!) The OZM-3 is typical of TL7-8 bounding mines – often known by the slang term "Bouncing Betty" – used against personnel from WWII on. Most armies had something similar during the second half of the 20th century.

The German *Schrapnellmine 35* (1935-1944), or SMi35, was the first mine of this type: Dmg 4d×2 [4d] cr ex, Wt. 8.8.

The U.S. equivalent is the *M16* (1953-): Dmg 6d×2 [4d] cr ex, Wt. 8.2.

M18A1 Claymore (USA, 1960-)

This directional, above-ground weapon is in service with the U.S. military and many other countries, and has been widely copied. It consists of a convex block of C4 explosive with 700 steel pellets embedded in the front, enclosed in a plastic case about the size of a pocket book. It comes in a 5-lb. bandoleer with blasting cap (p. 187), 33-yard wire, and 0.75-lb. military blasting machine (p. 187). With its folding legs deployed, the mine is pointed toward the desired area of effect and can be detonated remotely or by tripwire.

When triggered, everyone out to 270 yards in a 60° cone in front of the device is attacked at basic skill 9, with +9 for the rapid-fire bonus but minus the range penalty for distance from the mine. Treat this as a huge shotload (see *Multiple Projectiles,* pp. 172-174) with Dmg 2d(0.5) pi-, Range 55/270, RoF 1×700, Rcl 1. Resolve attacks in order of distance – if all 700 pellets somehow manage to hit something, no more-distant targets can be hit. While the pellets are directed forward, the explosion (6d×3 cr ex) isn't directional and affects a large area to the sides and rear; thus, the weapon is usually deployed 20+ yards from friendly positions. To see the Claymore at work, check out such action movies as *Platoon* and *Predator.*

The less-than-lethal *M5 Modular Crowd Control Munition-Ground Emplaced* (2001-) looks identical and works the same way, but fires a load of 600 plastic pellets. Treat the "Stingmore" as a shotload with Dmg 1d-2(0.2) cr, Range 15/75, RoF 1×600, Rcl 1, Cost $350. The explosion does only 2d+1 cr ex.

M86 PDM (USA, 1991-)

The M86 Pursuit Deterrent Munition (PDM) is a hand grenade-sized antipersonnel mine. American special-ops soldiers use it on the retreat, or for quick ambush and harassment. The user simply arms it and drops it on the ground. After a 25-second delay, it deploys seven 20' tripwires. After another 40 seconds, it's fully armed – and if disturbed, launches itself 6' above the ground and detonates. Left undisturbed, it self-destructs (explodes!) after four hours. Some TL8 artillery shells and cluster bombs scatter similar munitions.

Hand Grenades

Hand grenades first appear at TL4: hollow cannonballs – or containers made of pottery or heavy glass – filled with about a quarter-pound of gunpowder and fitted with a length of burning fuse (p. 187). They're a favorite naval weapon at TL4-5, as they have a devastating effect on the crowded decks of a warship . . . and a grenade in the powder magazine can sink a vessel that might withstand *hours* of pounding by cannon. Grenades of this type gradually disappear as firearms and artillery improve, although specialists such as combat engineers continue to use them until TL6, especially for sieges.

Modern hand grenades result from the perfection of time and impact fuses at mid-TL6. Historically, WWI played a decisive role in reestablishing grenades as important infantry weapons – almost all militaries (re-)introduced them during and after the Great War. This era saw the development of the most common subtypes:

- *Concussion* grenades have little or no fragmentation, relying on the blast of their explosive filler. Their small casualty radius allows use while advancing (that is, on the offensive, which is why these are also called *offensive* grenades). There may still be incidental fragmentation (p. B415) if a concussion grenade explodes on a hard surface (such as asphalt), in a pile of scrap metal, etc.
- *Fragmentation* grenades propel fragments farther than they can be thrown, so the thrower needs cover (such as a defensive position, which is why these are also called *defensive* grenades). These are the most common hand grenades.
- *Incendiary* grenades contain phosphorus (pp. 172, 188), thermite (p. 188), or a similar burning agent. While primarily used to create smoke, they're sometimes employed against personnel or to destroy artillery, maps, radios, vehicles, etc., at immediate risk of falling into enemy hands.
- *Smoke* grenades produce smoke for concealment or signaling. The smoke isn't harmful to humans and animals, although its aroma is a little unpleasant.

Various *nonlethal* grenades for police operations (e.g., riot control) appear at TL7-8.

Dirty Tech: Hand-Grenade Booby Trap

Booby traps involving hand grenades are common in guerrilla warfare. A classic example – widely encountered during the Vietnam War – is a fragmentation hand grenade placed inside a can fixed to a stake or a tree. The can is tilted downward so that a little pressure from the tripwire (p. 203) causes the grenade to slide out of the can, releasing the arming lever. The grenade explodes seconds later. Setting such a trap takes a couple of minutes and requires a roll against Soldier or Traps+4.

At TL4-5, grenadiers normally prepare their own grenades just before going into action. At TL6-8, hand grenades require little preparation but come unprimed. Grenade and detonator are shipped separately, and only combined before combat (10 seconds per grenade).

Except as noted below, *all* hand grenades are activated by pulling out the safety pin with its attached ring and letting the arming handle fly off (a Ready maneuver). The fuse doesn't begin to act until the handle is released, but the handle need move only a fraction of an inch. The pin can be reinserted.

Veteran fighters often "cook off" a hand grenade by letting the arming handle fly off, taking two Wait maneuvers, and *then* throwing the weapon. With a four-second fuse, this leaves no time for a defender to pick it up and throw it back (see p. B410). If a critical failure on Throwing causes the attacker to drop a cooked-off grenade, *he* may have no time to pick it up!

Diving on a live grenade is often portrayed in film and fiction as the ultimate sacrifice by a soldier for his comrades (see pp. B377, 415).

Grenade à Main (France, 1670-1850)

The *Grenade à Main* (simply "hand grenade") was the main weapon of French grenadiers for two centuries: a 4-pounder iron ball, about 3.2" across, with a removable screw-plug for loading the powder. The plug held the fuse – a short length of match (p. 187). Other militaries fielded similar designs. Use of these unreliable and somewhat fumble-prone grenades declined during the 18th century but never quite broke off until the late 19th century.

The grenadier had to light the fuse prior to throwing the grenade (a Ready maneuver). This was *impossible* in rain, etc. A typical fuse burned for around five seconds.

The *Grenade à Main Mle 1882* (1882-1914) was the same basic grenade given a mechanical time fuse for improved safety and reliability (Malf. 16): Wt. 2.6, Fuse 5. It was armed by pulling a ring (a Ready maneuver). This weapon was still in use during WWI.

Stielhandgranate (Germany, 1915-1928)

During WWI, the Germans adopted a style of concussion grenade that remained standard until the end of WWII: the *Stielhandgranate* ("stick hand grenade"). Americans nicknamed it the "Potato Masher" after its appearance. German military influence manifested itself in similar or identical patterns in Bolivia, China, Finland, and elsewhere.

The long wooden handle gave good leverage for a throw, compensating for the extra weight (+2 ST to figure distance; see p. B355). It also made the grenade awkward to carry and hide; German soldiers stuck it in their belt or even their boot, and improvised carriers from sandbags. To activate the grenade before throwing, the user twisted the end cap off the handle and pulled sharply on the string inside (two Ready maneuvers).

Several models existed during WWI and the interwar years. During WWII, the standard type was the *StiHGr24* (1928-1945), filled with TNT rather than black powder: Dmg 7d cr ex, Wt. 1.4. From 1943, one in three had a detachable 0.3-lb. fragmentation sleeve: Dmg 5d [2d] cr ex, Wt. 1.7. A 33-lb. case held 15.

The improvised *geballte Ladung* ("concentrated charge") – used to attack vehicles – consisted of six grenade heads bundled around one complete stick grenade: Dmg 6d×3 cr ex, Wt. 4.4.

The *NbHGr39* (1939-1943) was a smoke grenade with identical appearance, except for a white stripe: Wt. 1.9, Fuse 7-8. It develops a 7-yard-radius smoke cloud that lasts for 90 seconds.

Mills Number 36M Mk I (U.K., 1918-1972)

Developed from the almost identical Mills *Number 5 Mk I* (1915-1918), the Number 36M Mk I fragmentation grenade was produced in Britain for a long time. Hundreds of millions were made, and it was widely exported. It's *still* manufactured in India and Pakistan.

The "Mills bomb" was the first grenade with a deeply serrated cast-iron body. The serrations didn't actually control fragmentation (although William Mills might not have known this) but *did* give a better grip – especially in the slimy mud of a Flanders trench. Fragmentation with the Mills bomb was very uneven. Much of the cast iron was splintered, too small to cause serious injury, while an occasional large piece (especially the fuse and base) might travel 200 yards with enough force to kill. If the GM wishes, anything within 200 yards of the explosion could plausibly suffer a 2d fragmentation attack!

The original fuse delay was seven seconds. Starting in 1940, a four-second fuse became standard.

AMC MK II (USA, 1920-1942)

After WWI, the U.S. military copied the contemporary French-issue grenade, the *Grenade Défensive F1 Mle 1916,* which they had used during the war. The MK II had a deeply serrated oval body similar to that of the Mills bomb. The nickname "Pineapple Grenade" was obvious.

The MK II and minor variants saw heavy use during WWII and the Korean War. It was widely exported, and copies are still made in Chile, Taiwan, and Turkey. There are several similar designs, including the Soviet *Koveshnikov F-1* (1933-): Fuse 3-4.

AMC MK III (USA, 1920-1942)

This concussion grenade is a half-pound block of TNT in a cardboard body, which doesn't develop any fragments. Its final version, the *MK 3A2* (1943-), is still in use. Late-production weapons have a plastic body for better protection against humidity. Widely exported, this grenade is also copied in Israel, Taiwan, and Turkey, among other places.

Eihandgranate 39 (Germany, 1940-1945)

Although the StiHGr24 (see *Stielhandgranate,* pp. 190-191) was more visible, German forces used the *Eihandgranate 39* ("egg hand grenade model 1939") or EiHGr39 – a small concussion grenade with a pull-string igniter – in greater numbers during WWII.

Dirty Tech: Improvised Grenades

When hand grenades aren't available at all or in sufficient numbers, you can improvise. This *might* require knowledge of how to construct a simple fuse – make an Explosives (Demolition)+2 roll. Anybody can throw a stick of dynamite (pp. 184-185), though, and concocting a Molotov cocktail is as simple as it gets.

Jam-Tin Grenade (TL6)

During the Russo-Japanese War (1904-1905), and again in WWI, the realities of trench warfare often led soldiers to construct their own hand grenades. Most consisted of a slab of explosive in a metal container such as an empty flare round, 37×94mmR cartridge case, cigarette can, or jam tin (as shown in the film *Gallipoli*). Combat engineers usually assembled these munitions.

Any available explosive will work – including black powder (pp. 183-184), dynamite (pp. 184-185), and military demolition explosives such as picric acid. Fitting an impact fuse or a burning time fuse (p. 187) yields a makeshift offensive hand grenade. Attaching a wooden handle allows better handling. Adding a handful of large nails, tightly wrapped with thick wire, gives an improvised defensive grenade with adequate fragmentation. Each device requires an Explosives (Demolition) roll and 10 minutes' work.

A typical jam-tin grenade inflicts 5d cr ex damage – or 4d [2d] cr ex, if fitted with fragmentation material. Cost depends on the explosive, which is free for soldiers on the battlefield. Weight is about 2 lbs.

Molotov Cocktail (TL6)

A Molotov cocktail consists of a glass bottle (beer bottles are popular) half-filled with gasoline and fitted with a burning fuse – often an old rag. The container bursts upon hitting a hard surface, spilling the fuel, which immediately ignites. This incendiary is named after the Soviet war minister during the Finnish-Soviet Winter War (1939-1940), but it was first employed in the Spanish Civil War (1936-1939).

See *Molotov Cocktails and Oil Flasks* (p. B411) for rules. While rioters and guerrillas often employ Molotov cocktails as antipersonnel weapons, the original target was armored vehicles. Most TL6 and early TL7 fighting vehicles – and nearly all ordinary civilian motor vehicles at TL6-8 – have unprotected engine gratings through which burning gasoline can enter. Treat this as a "vital area," at -3 to hit (p. B554). A hit means the vehicle must make a HT roll immediately and again every three seconds until the fire burns out (2d×5 seconds). Failure indicates the engine breaks down. On a *second* failure, the engine catches fire; treat it as totally destroyed.

There are many refinements on the basic recipe – mixing the gasoline with diesel or oil, including rubber to make it sticky, etc. – but performance doesn't change. Making a Molotov cocktail requires *no* skill roll and five minutes' work. Cost is negligible. A bottle weighs 1-2 lbs.

Hand Grenades Table

See pp. B268-271 for an explanation of the statistics.

THROWING (DX-3 or Dropping-4)

TL	Weapon	Damage	Weight	Fuse	Bulk	Cost	LC	Notes
5	Grenade à Main	3d [1d] cr ex	2.2	3-5	-2	$10	1	[1]
6	Stielhandgranate	5d cr ex	1.3	4-5	-3	$20	1	[2]
6	Mills Number 36M Mk I	5d-1 [2d] cr ex	1.7	7	-2	$20	1	[3]
6	MK II	4d+1 [2d] cr ex	1.3	4-5	-2	$20	1	[3]
6	MK III	8d+2 cr ex	1	4-5	-2	$20	1	[3]
7	Eihandgranate 39	6d+1 cr ex	0.6	4-5	-1	$20	1	[3]
7	AN-M8	Smoke (7 yd.)	1.8	1-2	-2	$45	3	[3, 4]
7	AN-M14	Special	2	1-2	-2	$45	1	[3]
7	RPG-43	6d(10) cr ex	2.6	Impact	-2	$30	1	[3]
7	M26	8d+2 [2d] cr ex	1	4-5	-2	$30	1	[3]
7	M34 WP	2d [1d(0.2)] burn ex	1.5	4-5	-2	$50	1	[3, 5]
7	M67	9d [2d] cr ex	0.9	4-5	-1	$30	1	[3]
7	Diehl DM51	3d+2 [3d] cr ex	1	4-5	-2	$30	1	[3, 6]
7	Schermuly Stun	HT-5 aff (10 yd.)	0.5	1-2	-2	$30	1	[3, 7]
8	ARGES HG 86	3d-1 [2d] cr ex	0.4	4-5	-1	$25	1	[3]
8	M452 Stingball	1d+1 [1d-1 cr] cr ex	0.5	2-3	-1	$30	1	[3, 7]
	linked	HT-5 aff (10 yd.)						

Notes:

[1] Takes a Ready maneuver to light the fuse – or *five* Ready maneuvers if you must insert the fuse first! Malf. is 14.

[2] Takes *two* Ready maneuvers to screw off the cap and pull the cord.

[3] Takes a Ready maneuver to pull the pin or string.

[4] Fills a 7-yard radius with smoke; see p. B439. Cloud lasts about 80 seconds under normal conditions.

[5] Fills a 5-yard radius with smoke; see p. B439. Cloud lasts about 60 seconds under normal conditions.

[6] *With* fragmentation sleeve (Dmg 5d cr ex, Wt. 0.3 without).

[7] A Vision- and Hearing-Based affliction that affects a 10-yard radius. The Protected Hearing and Protected Vision advantages (or equivalent; e.g., hearing protection and dark goggles) *each* give +5 to the HT roll. Failure to resist means you're stunned; roll against HT-5 to recover each turn. Also creates smoke in the area of effect.

AMC AN-M8 (USA, 1940-1994)

This soup can-shaped device was typical of the chemical smoke grenades used by most armies since WWII. The fuse didn't burst the grenade – it ignited the filler. The AN-M8 burned for two minutes, generating a cloud of thick, white smoke over a 7-yard radius; see *Smoke* (p. 171). The canister grew hot enough (about 2,200°F) to burn unprotected flesh (1d-2 burn) and set fire to dry vegetation, paper, and similar flammables (see *Making Things Burn,* p. B433).

The *M7* series (1935-) emits tear gas (p. 171) instead, filling a 7-yard radius for 25 seconds: Wt. 1, Cost $175.

The *M18* (1942-) generates red, yellow, green, or violet smoke for signaling, and fills a 7-yard radius for 70 seconds: Wt. 1.2.

The *M83* (1994-) replaces the AN-M8 in U.S. military service, and fills a 7-yard radius for 50 seconds: Wt. 1, Cost $35.

AMC AN-M14 (USA, 1943-1970)

This can-shaped device contained over 1.6 lbs. of *thermate* incendiary. Placed inside an abandoned tank, in the barrel of a captured artillery piece, or atop secret radio or encryption equipment, it would soon destroy the hardware. It also radiated enough heat to ignite flammables within two yards, and burned even underwater.

See *Thermite* (p. 188) for effects; thermate is identical for game purposes. The AN-M14 burns for 40 seconds. Anything in contact with it takes 3d burn damage per second and permanently loses DR 1 per 10 points of damage.

RPG-43 (Russia, 1943-1945)

The *Ruchnaya Protivotankovaya Granata obrazets 1943g* ("hand-held antitank grenade model 1943") was a stick grenade with a 95mm shaped charge in the head and a cloth stabilizer in the tail. It was designed during WWII to give Soviet infantry a close-range weapon for use against armored vehicles. The Viet Cong employed it in the Vietnam War and the Egyptians used it during the 1973 Yom Kippur War.

This RPG-43 must hit head-on to be effective. Throwers unfamiliar with the special hurling technique required have -5 to Throwing skill. Attack from above using the Dropping skill (p. B189) is another option.

AMC M26 (USA, 1953-1970)

This lemon-shaped fragmentation grenade had a smooth, sheet-metal body. Inside, a tight coil of notched wire surrounded the explosive charge. The M26 superseded the MK II (p. 19) with the U.S. military after the Korean War, and served in America's subsequent conflicts until the 1970s. Widely copied – including in Germany, Israel, the Netherlands, South Africa, and the U.K. – the M26 is likely to turn up almost anywhere even today.

AMC M34 (USA, 1953-)

Also known as "Willy Pete," this grenade scatters burning white phosphorus fragments when it explodes. The result is an instant – and *dangerous* – hot smokescreen. The 5-yard-radius smoke cloud lasts for about a minute, depending on the weather. See also *White Phosphorus (WP)* (p. 172).

AMC M67 (USA, 1971-)

This baseball-sized fragmentation grenade is current issue in U.S. military service. A replacement for the M26 (p. 190), it's safer, lighter, and easier to throw. It's widely distributed, and also made in Canada, South Korea, and Taiwan.

Diehl HGR DM51 (Germany, 1976-)

The *Handgranate DM51* is a fragmentation grenade with a removable plastic sleeve containing several thousand steel balls. Without the sleeve, it functions as a concussion grenade: Dmg 5d cr ex, Wt. 0.3. The DM51 is the German military's standard combat grenade, and has also been exported.

Schermuly Stun Grenade (U.K., 1976-)

Stun munitions such as this Schermuly design – often called "flashbangs" due to their blinding flash and near-deafening bang – appeared during the 1970s. Originally intended as training grenades, they were first used in the 1977 hostage-rescue operation executed by the German GSG9 antiterror unit in Mogadishu. Since the 1980s, they've been standard issue for SWAT units and special-ops forces.

ARGES HG 86 (Austria, 1986-)

The *Handgranate 86* is a small fragmentation grenade ideally suited for house-to-house combat. In 2001, the U.S. Army Special Forces used it for cave-clearing in Afghanistan.

Accuracy Systems M452 Stingball (USA, 1987-)

This less-than-lethal grenade has a plastic body filled with 100 soft rubber balls. The explosive blast can stun, while the rubber balls inflict a painful sting over a 7-yard radius. The U.S. Navy and Marines adopted the M452 in 1998.

The *M452C Comboball* (1987-) is almost identical, but also spreads a 3-yard-radius cloud of tear gas powder (see *Tear Gas,* p. 171), which settles after a second: Cost $35.

Rifle Grenades

Grenades fired from the muzzle of a rifle first appear at TL5. At TL6 and early TL7, most such weapons require a special launcher: a "spigot" or a "cup" affixed to the rifle's muzzle. While this is present, the gun cannot fire normally. Attaching or detaching the launcher takes five seconds. With this device in place, the grenadier must typically load his rifle with a blank cartridge or other special round (three seconds), and then take out the grenade and place it on the launcher (two seconds). After that, the grenade is ready to launch!

Some TL6-7 and most TL8 rifle grenades don't rely on special cartridges for propulsion. *Bullet-trap* designs are launched by trapping a conventional service round (anything but an explosive bullet) in the tail. In *bullet-through* models, the bullet passes through the hollow grenade. These munitions also dispense with separate launchers; for instance, the majority of historical Western patterns could be fired from the muzzle of any rifle with a NATO-standardized flash-hider.

In all cases, use the Guns (Grenade Launcher) skill to fire rifle grenades.

AMC M17, 56mm (USA, 1939-1943)

Fired from a spigot launcher ($30), this was the body of the MK II fragmentation grenade (p. 191) screwed onto a tail and fitted with an impact fuse. The detachable launcher for the Springfield M1903 (p. 112) weighed 0.5 lb.; that for the Springfield M1 Garand (p. 112) weighed 0.75 lb.

Bergmann GSprgr30, 30mm (Germany, 1942-1944)

The *Gewehrsprenggranate 30mm* ("30mm HE rifle grenade") was fired from a 1.7-lb. cup launcher ($50) attached to the Mauser Kar98k (see *Mauser Gew98,* p. 111). Some 1.5 million launchers were made during WWII; one was issued to every German infantry squad. A 0.6-lb. sight was issued but unpopular. The GSprgr30 was propelled using a blank cartridge. In a pinch, it could also function as a hand grenade: Fuse 6.

The *Gewehrpropagandagranate* ("propaganda rifle grenade") scattered 40 3.5"×6" leaflets instead: Range 50/500, Wt. 0.5.

The HASAG *grosse Gewehrpanzergranate 40mm* ("large antitank rifle grenade"), or GGPzgr40, featured a 40mm HEAT warhead: Dmg 7d(10) cr ex with 6d cr ex linked, Range 10/150, Wt. 0.9. Japanese copies were fired from a 1.5-lb. cup launcher attached to the Arisaka 99 Shiki (see *Arisaka Meiji 38 Shiki Shoujuu,* p. 112).

Rifle Grenades Table

See pp. B268-271 for an explanation of the statistics.

GUNS (GRENADE LAUNCHER) (DX-4 or most other Guns at -4)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	Bulk	Cost	LC	Notes
7	AMC M17	4d+1 [2d] cr ex	0	10/165	1.6	1	1(5)	-1	$25	1	[1, 2]
7	Bergmann GSprgr30	4d [2d] cr ex	0	10/300	0.6	1	1(5)	-1	$15	1	[1, 2]
7	MECAR Energa-75 *linked*	7d×3(10) cr ex 7d×2 cr ex	0	10/300	1.4	1	1(5)	-2	$30	1	[1, 2]
8	Rafael Simon 150	8d cr ex	0	15/35	1.5	1	1(5)	-3	$50	1	[1, 2]

Notes:

[1] Add grenade's Bulk to rifle's Bulk.

[2] First Range figure is *minimum* range, not 1/2D. Below minimum range, or if the grenade fails to explode, rifle grenades do 1d+1 cr.

MECAR Energa-75, 75mm (Belgium, 1946-1970)

The Energa-75 rifle grenade was a HEAT munition originally designed to be launched from a 0.75-lb. spigot launcher ($30) attached to such rifles as the Enfield Number 4 Mk I (see *Enfield SMLE Mk III,* p. 112). It was soon modified to be fired from 7.62×51mm NATO rifles with integral launchers, such as the FN FAL (p. 115). It was widely adopted, users including Belgium, the Netherlands, Rhodesia, South Africa, and the U.K.

The U.S. Army used a copy called the *M28* (1950-1953) during the Korean War, fired from a 0.75-lb. spigot launcher ($30) attached to the Springfield M1 Garand (p. 113).

Rafael Simon 150, 100mm (Israel, 1992-)

This bullet-trap rifle grenade is designed for breaching doors and windows – especially in hostage-rescue operations and urban combat. Any 5.56×45mm rifle with a NATO flash-hider can launch it. A long aluminum standoff rod ensures that the explosion occurs at the proper distance, destroying doors with minimal collateral damage. The Simon is in service with the Israeli and French militaries, and the U.S. Army adopted it as the M100 Grenade Rifle Entry Munition (GREM) in 2000.

Bombs

Shortly after combat aircraft appear at TL6, they're carrying bombs; the first purpose-built aircraft bombs entered service in 1912. Most of these munitions are "dumb": they're simply dropped, and explode upon hitting the ground. Many of the weapons below arm the planes described in Chapter 8.

PuW12.5, 90mm (Germany, 1916-1918)

The PuW-series munitions were the first modern streamlined bombs. The 12.5-kilogram model was the lightest variant used by the Germans in WWI.

Alkan MMN, 89mm (France, 1917-1926)

This was the standard light bomb of the French military during WWI and the 1920s.

25-lb. MK II, 111mm (USA, 1918-1925)

This was the U.S. military's standard light bomb through WWI and the 1920s.

SC50, 200mm (Germany, 1930-1945)

The *Sprengbombe, Cylindrisch, 50kg* ("50-kilogram cylindrical demolition bomb") was one of the lighter bombs the German *Luftwaffe* used during WWII.

Bombs Table

See pp. B268-271 for an explanation of the statistics.

ARTILLERY (BOMBS) (IQ-5)

TL	Weapon	Damage	Weight	Cost	LC	Notes
6	PuW12.5	6d×3 [4d+2] cr ex	25	$500	1	
6	Alkan MMN	6d×3 [4d+2] cr ex	22	$500	1	
6	MK II	6d×6 [6d] cr ex	25	$750	1	
6	SC50	6d×15 [5d×2] cr ex	122	$1,500	1	
6	SC250	6d×35 [6d×3] cr ex	548	$3,500	1	
6	AN-M30	6d×15 [5d×2] cr ex	111	$1,350	1	
7	MK 81	6d×20 [6d×2] cr ex	262	$1,800	1	
7	MK 82	6d×28 [7d×2] cr ex	531	$2,200	1	
7	CBU-55/B	6d×65 cr ex	510	$10,000	1	[1]

Notes:

[1] Fuel-air. Divide damage by (2 × distance in yards from center of blast).

SC250, 370mm (Germany, 1930-1945)

The *Sprengbombe, Cylindrisch, 250kg* ("250-kilogram cylindrical demolition bomb") was the most common bomb dropped by the German *Luftwaffe*.

100-lb. GP AN-M30, 208mm (USA, 1942-1960)

This was a light general-purpose bomb employed by the USAAF in WWII.

250-lb. GP MK 81, 228mm (USA, 1955-)

This is the standard light, low-drag general-purpose bomb used by the U.S. military and many of its allies since the 1950s.

500-lb. GP MK 82, 273mm (USA, 1955-)

The MK 82 is probably the most common "dumb" bomb worldwide today.

500-lb. CBU-55/B, 256mm (USA, 1967-1975)

This low-drag fuel-air explosive bomb was dropped from helicopters and low-performance airplanes. It scattered three submunitions, which released an 8-yard-radius cloud that exploded violently. Its main applications were detonating minefields and clearing landing zones. See also *Fuel-Air Explosives* (pp. 186-187)

Nuclear Weapons

Nuclear weapons, an early TL7 development, derive their immense destructive power from nuclear fission or fusion. The energy released by a nuclear explosion takes the form of a thermal pulse (heat), concussion, hard radiation, and – in a low-altitude burst – residual radiation (fallout). A nuclear device thus inflicts crushing damage with the explosion (ex) modifier, linked to burning damage with the explosion, radiation (rad), and surge (sur) modifiers; see *Damage Modifiers* (p. B104). Divide burning damage by only (2 × distance in yards from center of blast). *Flash and Blindness* (p. 182) always applies!

It's customary to rate a nuclear weapon's yield in terms of the quantity of TNT to which it's equivalent. This is usually expressed in *kilotons* (thousands of tons of TNT) or *megatons* (millions of tons). Nuclear explosives don't appear on the *Relative Explosive Force Table* (p. 183), though, because most of a nuclear device's weight is that of the detonator, not the explosive.

The first atomic bomb used in war was a fission device named "Little Boy." Released over Hiroshima, Japan on August 6, 1945, it devastated the city with the equivalent of 12,500 tons of TNT, or 12.5 kilotons (6d×10,000 cr ex with 6d×6,500 burn ex rad sur linked). The hydrogen bomb, developed in the mid-1950s, further refined the art of destruction. Properly known as a *thermonuclear* device, this two-stage weapon employs a fission bomb to provide the incredible heat necessary to fuse hydrogen. The yield can approach 100 megatons – well beyond what fission can accomplish. At the other end of the spectrum, compact, modest-yield nuclear weapons become possible at mid-TL7. The U.S. and Russia produced miniaturized warheads weighing 50-100 lbs., with yields of about 0.1 kiloton (6d×900 cr ex with 6d×650 burn ex rad sur linked).

EMP

Unshielded electronic equipment within the visual horizon of a nuclear explosion risks a surge effect that can incapacitate it. This side effect of a nuclear blast is termed *electromagnetic pulse* (EMP). The larger or more numerous the bombs, the greater the EMP; for example, a 10-megaton nuclear detonation 200 miles above the center of the continental U.S. would blanket the entire country in its pulse.

Treat EMP as an Affliction that only affects electronics and those who have the Electrical disadvantage (p. B134). This effect is distinct from the surge modifier on the explosion's burning damage! Every vulnerable target in the radius of the EMP suffers a HT-8(2) aff attack. A failed resistance roll means that item is knocked out of action until repaired. Affected solid-state technology is likely to be *permanently* damaged: all repair rolls are at -10. Repairs on other devices are at only -4.

A variety of TL7-8 military hardware is shielded entirely against EMP. Fiber-optic systems are also immune. Other equipment can be protected by surrounding it with metal that is in turn grounded.

Fallout

Residual radiation – better known as "fallout" – consists of material picked up, irradiated, and spread around by a nuclear explosion. It's generally only a factor in a "ground burst," where the nuclear weapon's fireball touches the ground. When it does occur, though, the radioactive debris distributed by the mushroom cloud poses a *serious* threat to anyone passing through or downwind of the blast site.

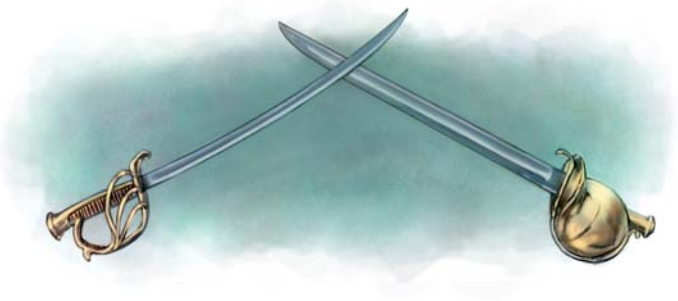
In game terms, assume that the contaminated "footprint" is an area 800 yards long by 200 yards wide, drifting downwind, for a 0.1-kiloton nuke. Double length and width for each tenfold increase in yield! Everything in this zone suffers radiation damage, measured in rads. Individuals passing through soon after the detonation are exposed to 100 rads per hour. This drops to 10 rads per hour about two days after the explosion, and to 1 rad per hour some two weeks afterward. For effects, see *Radiation* (pp. B435-436).

Building a Nuclear Device

Realistically, designing and building a nuclear weapon requires a team of dozens of diverse specialists, several years, and the financial resources of a small country. In a cinematic game, though, a lone gadgeteer might be able to create a "home-made" nuke. Treat this as an Amazing invention (p. B473) that requires the Engineer (Nuclear) skill and several pounds of weapons-grade fissionables. Since such materials are almost never available on the open market, the inventor will likely have to steal them . . . or develop a working enrichment process that allows him to manufacture his own, which is a *separate* Amazing invention!

Melee Weapons

Trench fights, barroom brawls, alleyway holdups, and similar close-combat situations are often settled hand-to-hand at TL5-8, despite advances in guns and explosives. High-tech axes, swords, clubs, etc., rarely differ much from their low-tech predecessors, except in terms of materials quality (see *Melee Weapon Quality,* p. B274). For much more on melee weapons – including detailed rules for using them – see ***GURPS Martial Arts.***



Battleaxes

At TL5, the hatchet (p. B271) still serves the world's navies as a boarding weapon. Some irregulars and infantry forces – such as early 18th-century British and French grenadiers – prefer it to the bayonet (p. 197) as backup for their muskets and rifles. Both Native Americans and white settlers use the *tomahawk* (from the Algonquian *tamahákan,* meaning "the thing that cuts"): an iron-bladed war hatchet balanced for throwing (p. B276) and sometimes combined with a tobacco pipe.

At TL6-8, axes see more use as tools than as weapons (see *Axes,* pp. 24-25). During the Vietnam War, though, the U.S. Army Special Forces and U.S. Marine Corps issued a spiked tomahawk. Treat this as a fine (TL7) hatchet. The spike does -1 damage relative to the weapon's cutting attack but is *impaling,* and the rules for picks apply (p. B405).

Blades

Swords are still in wide use at TL5: infantry officers, cavalrymen, and police carry sabers, sailors use cutlasses, and combat engineers tote shortswords. The ordinary infantryman has his bayonet (p. 197). Knives of various lengths and descriptions equip irregulars, hunters, criminals, and just about everybody else.

At TL6, swords grow rarer as handguns become more prevalent. Military and police officers who carry them do so primarily for ceremonial purposes. Only bayonets and knives remain in widespread service.

Bayonets are still standard issue at TL7, while swords all but disappear from official combat service. High-quality swords are made for collectors and hobbyists, though, while low-quality ones flood pawnshops and fill the pages of martial-arts catalogs. The most advanced knives in history become available at TL7 (all blades are *fine* quality at no extra cost; see p. B274), as almost every gunman wants steel for backup.

Bayonets

A *bayonet* is a blade affixed to a firearm's muzzle, originally developed at TL4 to enable the single-shot muskets carried by soldiers and hunters to serve as effective melee weapons once discharged. At TL5, the bayonet completely replaces the pike in front-line military service. At TL6-8, guns can fire multiple shots and reload quickly, but close combat remains a battlefield possibility; a bayonet-tipped rifle is often the last line of defense.

Fixing a bayonet takes four Ready maneuvers: one to draw the bayonet, one to change grips, one to mount the blade, and one to ready the firearm as a melee weapon. Fast-Draw (Knife) can reduce this to three seconds.

Use the Spear skill to stab with a shoulder-arm bayonet (to club with the weapon's butt, see *Clubs,* p. 198). Damage is thr+3 impaling. Most TL4-6 long arms qualify for Reach 1, 2*, while TL7-8 weapons usually have Reach 1. Sidearm bayonets require the Knife skill and get the reach and damage of a large knife. Being unfamiliar with a particular gun-bayonet combination gives -2 to hit; see *Familiarity* (p. B169). Those on the *receiving* end of a bayonet charge may need to make a Fright Check, at the GM's discretion. For more on bayonet fighting, see ***GURPS Martial Arts.***

A fixed bayonet changes the firearm's performance *as a gun.* It disturbs balance and alters barrel vibrations, degrading accuracy: -1 to Guns skill. It also makes a muzzleloader slower to load – multiply reloading time by 1.1 and round up. Its weight adds to the gun's weight, making it a heavier load.

For the weight and reach of a particular bayonet, see the description of the weapon that mounts it. Weight figures *don't* include a sheath. Indeed, many TL5-6 bayonets don't even have one!

Socket Bayonets

A TL5 *socket bayonet* has a sleeve that slides over the muzzle. It locks to the gun via a lug that fits into a slot in the sleeve. Its 15-25" blade is offset to allow firing and loading. Most such bayonets have no cutting edge and can only make thrusting attacks. They usually lack a proper grip and can't be used without the gun.

Sword/Knife Bayonets

A *sword bayonet* is a shortsword, saber, or large knife, typically 15-25" in length; a *knife bayonet* is 6-12" long. Either attaches to the muzzle via a bayonet mount. At TL5, such bayonets are rarer than socket bayonets and usually issued to specialists such as combat engineers. At TL6-8, they replace other designs and gradually grow shorter; common lengths are 12" at TL6, 7" at TL7-8.

Many TL7-8 knife bayonets are multi-purpose tools. The back of the blade is serrated for use as a saw (sw-3 cut on rope, wood, or soft metal) and the pommel is a serviceable hammer. A slot in the blade clips to the sheath, turning the combination into wire cutters (p. 25). Some designs have additional built-in tools, such as screwdrivers and bottle-openers! The GM may count these bayonets as improvised tools in certain situations – but they're wholly inadequate for most routine tasks (-5 to skill at least).

By TL8, some militaries no longer issue bayonets. Multi-purpose knives, more tool than weapon, are common. Still, the blade survives – it never misfires or runs out of ammo!

Machete (TL5). This long knife has a heavy, flared, single-edged blade optimized for chopping. While designed as a tool for cutting sugarcane or clearing a path through jungle, it often serves as a weapon at TL5-8 – such as in the Cuban revolution of the late 19th century, the Chaco War in the 1930s, and the Rwandan civil war in the 1990s. It's usually cheap quality. A 0.3-lb. sheath is included. LC4.

Push Knife (TL5). The hilt of this T-shaped knife is at 90° to the blade, which protrudes from between the fingers of the fist. There are many different sizes and patterns, but those most common at TL6-8 are small. A push knife issued to British secret agents during WWII consisted of a narrow pick mounted on a contoured metal grip. Some commercial push knives at TL7 are disguised as belt buckles (+4 to Holdout). A 0.25-lb. sheath is included. LC3-4.

Survival Knife (TL5). This is a heavy hunting and fighting knife, often with a serrated section for sawing. Its prototype was the 19th-century Bowie knife. Modern versions often have a hollow hilt to hold a variety of useful or not-so-useful survival items (see *Survival Kits,* pp. 58-59). This hollow handle might even accept a pole, yielding a makeshift spear; see the film *First Blood* for a famous specimen that sparked considerable interest among fans. Pouches on the 0.5-lb. sheath may hold further equipment, such as a compass (p. 52) or a whetstone (p. 25). LC4.

Switchblade (TL5). This easily concealed small knife springs or slides out of its case handle (Holdout 0). It's used for quick stabs and slashes. Paratroopers carry it for cutting parachute lines. Switchblades are flimsy, and may snap if used to parry (1-4 on 1d). LC3-4.

Sword Cane (TL5). This weapon is a 2-3' blade concealed in a walking stick. Fashionable gentlemen – and those posing as defenseless invalids – carry it in situations where weapons are forbidden or not tolerated. Treat as a smallsword, but due to the thin blade, quality is a level lower than what's paid for. It completely lacks a guard, which gives -2 to Parry. The 1-lb. sheath doubles as a baton. LC3-4.

Katana (TL6). Japanese soldiers during WWII were issued machine-made "samurai swords" such as the *99 Shiki Guntou* ("type 99 army blade"). Modern cutlery shops sell similar models. Some lack the refinements commonly associated with Japanese swords, and may be of cheap quality; others are of fine or even very fine quality due to better materials. Many are simply good-quality. Modern blades are shorter and lighter than traditional katanas. The 1.25 lb. sheath doubles as a baton. LC4.

Optional Rule: Sheaths

As noted on p. B270, the costs listed for knives and swords in the *Melee Weapon Table* (pp. B271-274, p. 200) include the price of a good sheath or scabbard. This is counted in the weapon's weight. These *optional* rules aim to more clearly distinguish blade from sheath.

The weights given for swords and knives are *roughly* 2/3 weapon and 1/3 sheath. A 1-lb. combat knife is a 0.7-lb. blade in a 0.3-lb. sheath. A 3.75-lb. katana is a 2.5-lb. sword in a 1.25-lb. sheath. And so on.

These weights assume a *rigid* scabbard made of bamboo, wood, metal, or reinforced leather, which protects both blade and wearer from damage (e.g., when falling from a horse). If such a sheath weighs at least 1 lb., it can also serve as a baton in an emergency – but as it's hollow, treat it as *cheap* quality for breakage purposes. Some sheaths are designed for parrying (treat as *good* quality), or for use as snorkels, wire cutters, etc., but these options increase cost.

Adventurers may opt to carry blades in *flexible* sheaths made of canvas, soft leather, plastic, etc. Weight is negligible, and weapon weight is 2/3 that listed on the table. Such lightweight sheaths can't function as weapons and give the blade -1 on HT rolls to avoid corrosion and incidental damage (see p. B485).

A blade with *no* sheath has -2 on HT rolls, and the GM may require DX rolls to avoid self-inflicted injury!

A replacement sheath costs 1/10 the price of a good-quality weapon if flexible, twice that if rigid. Reinforced sheaths and sheaths with built-in tools cost double or triple (GM's option).

Trench Knife (TL6). This is simply a large knife with a knuckle guard that lets it function as brass knuckles when punching. Most U.S. Marine trench raiders during WWI carried an M1918 trench knife and a Colt M1911 (p. 98), and found both indispensable. It includes a 0.5 lb. sheath. LC4.

Tactical Folding Knife (TL8). This palm-sized folding knife (Holdout 0) unfolds with a flick of the wrist. This is a free action – an improvement over less-advanced folders, which require a Ready maneuver and *two* hands to open. Has either a 0.25 lb. belt pouch *or* a belt clip (+1 to Fast-Draw, -2 to rolls for incidental damage; see *Sheaths,* see box). LC3-4.

Blade Composition

See p. B275 for basic blade materials as well as some exotic ones. A few additional options appear at TL6-7:

Stainless Steel (TL6). A stainless-steel blade is corrosion-resistant and requires less maintenance than a typical carbon-steel one. The additives involved make it brittle and more likely to snap under pressure, however. Knives, swords, and axes can be stainless at no extra cost. Stainless swords are cheap (not good) at TL6 and good (not fine) at TL7-8. Quality can be improved by up to two levels, but this costs double – 8 and 40 times list price – due to the expensive treatments required to offset the degraded materials properties.

Ceramic (TL7). The main advantage of a ceramic blade is that a security metal detector (p. 206) won't find it. It still shows up clearly in an X-ray baggage screener (pp. 206-207). Damage is unmodified. Treat as *cheap* quality for breakage purposes, as it chips more easily. Triple cost and halve weight.

Titanium (TL7). Titanium blades, used by underwater demolition teams and salvage divers, are nonmagnetic, corrosion-resistant, and lighter than comparable steel blades. Treat as *very fine* quality for breakage purposes. Double cost and multiply weight by 0.75.

Clubs

Clubs are common at TL5-8. Policemen are issued nightsticks and riot-control batons, criminals and security forces carry blackjacks, and anybody might brandish the proverbial "blunt instrument" – tire iron, baseball bat, fence plank, fireplace poker, etc. Both improvised *and* industrially made clubs, maces, and morningstars were used on a large scale in WWI trench fighting.

Rifle Butt (TL4). Striking end-on with the butt of a shoulder arm uses the Staff skill and inflicts thr+2 crushing. Holding the gun by the barrel and swinging it like a baseball bat requires the Two-Handed Axe/Mace skill, does sw+3 crushing, and is only advisable with TL4-5 single-shot muskets and rifles (which are built for it) – the GM may require a HT roll to avoid breakage for other firearms. In general, TL4-6 long arms have Reach 1, 2*, while TL7-8 models are Reach 1. Sidearms use *Pistol Whipping* (p. 93).

Expandable Baton (TL6). This steel baton expands using an internal spring or gravity. The latter version takes a Ready maneuver to flick open – or no time at all on a successful Fast-Draw (Sword) roll. Retracting either type requires tapping it on a hard surface. Such batons are about 12" long closed (Holdout -1), 30" long open (Holdout -3). Security forces often use them, and their concealability makes them convenient for personal defense. LC4.

Tonfa (TL7). Also known as a "side-handle baton," this is a modernized plastic version of the TL3 Okinawan club. Introduced to U.S. police forces in 1958, it has become widespread with Western law enforcement. LC4.

Combination Weapons

It seems as though weapon designers have always had a mad urge to *combine.* The invention of gunpowder gave further impetus to this proclivity. See *Bayonets* (p. 197) for a simple combination of gun and melee weapon, *Pocketknife Pistol* (p. 98) for a more involved one. Further examples appear below. Anything can be built for a price. To combine multiple melee weapons, see ***GURPS Martial Arts.***

Elgin Cutlass Pistol, .54 Caplock (USA, 1838)

This smoothbore pistol, designed by George Elgin, was made to order for the U.S. Navy by Cyrus Allen, and had an

integral 11" blade forged by Nathan Ames below the barrel. It holds the twin distinctions of being the U.S. military's first percussion handgun *and* its only official combination weapon. The Navy acquired 150 for issue to the 1838 Wilkes Expedition to the South Sea. As well, a few were sold commercially. Treat it as large knife (p. B272) – at -1 to Knife skill – in melee combat. For gun stats, see the *Non-Repeating Pistols Table* (p. 91). LC3.

Sedgley Glove Pistol MK 2, .38 S&W (USA, 1944)

Designed for U.S. Naval Intelligence during WWII, the Sedgley Glove Pistol MK 2 probably never saw use in combat. It was a sturdy glove (DR 1) with a metal plate riveted to the back of the hand. This mounted a very short barrel loaded with a single .38 S&W pistol cartridge (Dmg 2d-1 pi). It was fired by punching the target.

Use DX, Boxing, Brawling, or Karate to hit. The bullet's damage is linked to that of a successful punch; the two automatically hit the same location. The pistol doesn't go off if the target dodges the punch, but if he parries it, the *shot* may still hit the parrying arm or weapon – treat as *Hitting the Wrong Target* (p. B389). Reloading takes six seconds. $50, 0.5 lb. LC2.

TsNIITochMash NRS-2, 7.62×42mm (Russia, 1986-)

The *Nozh Razvedchika Strelyayushyi-2* ("shooting scout knife") is a combat knife with a firing chamber in the handle; the muzzle is at the butt end. It fires a "silent" round that uses the piston principle (see *Silent Ammunition*, p. 165), making it useful for sentry removal. To shoot, reverse the knife – via a Ready maneuver or a suitable Shtick (p. 250) – and press the trigger bar set into the handle (normally blocked by a safety catch). See the *Non-Repeating Pistols Table* (p. 91) for gun stats. Treat it as large knife (p. B272) in melee combat. The 0.6-lb. sheath includes a screwdriver, and mates to the knife to function as a wire cutter. LC2.

Condor AM-402, 12G 2.75" (Brazil, 1990-)

Batons capable of firing cartridges – typically tear gas loads – have been around since the 1920s. The AM-402 is a rubber-covered aluminum baton consisting of two parts that screw together: the handgrip houses the thumb trigger and firing mechanism, while the forward portion acts as chamber and barrel. It holds a single 12-gauge cartridge. The usual round discharges a tear gas cloud from the muzzle (treat as *Tear Gas Spray*, p. 180, with Shots 1), but it can fire any type of 12-gauge cartridge (see *Exotic Shotgun Ammo*, p. 103). See the *Non-Repeating Pistols Table* (pp. 91) for gun stats, and treat it as baton (p. B273) wielded with the Shortsword skill in melee combat. The similar *AM-402T* (1999-) is shaped like a tonfa (p. 198): Wt. 1.6. LC2.

Dirty Tech: Improvised Melee Weapons

Most people – even adventurers – aren't armed *all* the time. Ambushed in their kitchen, at a cocktail party, or at the grocery store, they might have to rely on whatever is at hand. See *Improvised Weapons* (p. B404) for rules, Chapter 3 for tools useful as weapons, and ***GURPS Martial Arts*** for more of both.

Electric Stun Weapons

Electric stun weapons deliver a high-voltage, low-amperage electric current on contact. A hit means the victim must make a HT-3 roll or be stunned. On a failure, he's incapacitated for as long as the device remains in contact and for (20 - HT) seconds afterward, minimum one second. After that time, he may roll at HT-3 each second to recover. Note that the electric current may start a fire if the target is covered in flammable liquid such as alcohol, gasoline, or many pepper sprays! For other important details, see *Nonlethal Electrical Damage* (p. B432).

Cattle Prod (TL7). A cattle prod is 3' long and delivers an electric jolt through contacts on the tip. This is sufficient to burn skin; a successful thrusting attack to an unprotected location does 1d-3 burning damage. While cattle prods aren't legal antipersonnel weapons in most places, they're easily acquired across the U.S. and elsewhere. A prod requires 6×S batteries, which last for thousands of "zaps." LC4.

Stun Gun (TL8). A "stun gun" isn't a *gun* at all, but a handheld contact device that uses an electric current to disorganize nerve function. Relatively small – just a handgrip with protruding contacts (Holdout -1) – it's sometimes concealed in such everyday items as cell phones. A stun gun requires 2×S batteries, which last for thousands of stuns. Legality is a touchy issue: stun guns are legal defensive weapons (LC4) in many jurisdictions, including most of the U.S., but *illegal* (LC2) in numerous others, such as in the states of New York, New Jersey, and Hawaii, and in Australia, Canada, India, Japan, and the U.K.

Stun Baton (TL8). A stun baton is a stun gun built into a light baton – mainly to increase reach. It has contacts running along the sides, which allows swung attacks as well as thrusts. A stun baton requires 2×S batteries, which last for thousands of stuns. For LC, see the discussion for stun guns (above).

Melee Weapon Table

See pp. B268-271 for an explanation of the statistics.

BRAWLING or DX

TL	Weapon	Damage	Reach	Parry	Cost	Weight	ST	Notes
6	Trench Knife	thr cr	C	0	$45	1.5	–	[1]
7	Tonfa	thr cr	C	0	$40	1	–	[1]
8	Stun Gun	HT-3(0.5) aff	C	No	$25	0.5	2	[2]

BROADSWORD (DX-5, Force Sword-4, Rapier-4, Saber-4, Shortsword-2, or Two-Handed Sword-4)

TL	Weapon	Damage	Reach	Parry	Cost	Weight	ST	Notes
6	Katana	sw+1 cut	1	0	$550	3.75	10	
	or	thr+1 imp	1	0	–	–	10	

KNIFE (DX-4, Force Sword-3, Main-Gauche-3, or Shortsword-3)

TL	Weapon	Damage	Reach	Parry	Cost	Weight	ST	Notes
5	Machete	sw-1 cut	C, 1	0	$50	1.5	7	
	or	thr-1 imp	C	0	–	–	7	
5	Push Knife	thr imp	C	-1	$30	0.5	5	[3]
5	Survival Knife	sw-2 cut	C, 1	-1	$45	1	6	
	or	thr imp	C	-1	–	–	6	
5	Switchblade	sw-3 cut	C, 1	No	$30	0.5	5	
	or	thr-1 imp	C	No	–	–	5	
6	Trench Knife	sw-2 cut	C, 1	-1	$45	1.5	6	
	or	thr imp	C	-1	–	–	6	
8	Tactical Folding Knife	sw-3 cut	C, 1	-1	$30	0.5	5	
	or	thr-1 imp	C	-1	–	–	5	

SHORTSWORD (DX-5, Broadsword-2, Force Sword-4, Jitte/Sai-3, Knife-4, Saber-4, Smallsword-4, or Tonfa-3)

TL	Weapon	Damage	Reach	Parry	Cost	Weight	ST	Notes
6	Expandable Baton	sw cr	1	0	$60	2	6	
	or	thr cr	1	0	–	–	6	
7	Cattle Prod	1d-3 burn	1	0	$50	2	3	
	linked	HT-3(0.5) aff	–	–	–	–	–	[2]
8	Stun Baton	sw-1 cr	C, 1	0	$60	1.5	6	
	or	thr-1 cr	C, 1	0	–	–	6	
	linked	HT-3(0.5) aff	–	–	–	–	–	[2]

SMALLSWORD (DX-5, Main-Gauche-3, Rapier-3, Saber-3, or Shortsword-4)

TL	Weapon	Damage	Reach	Parry	Cost	Weight	ST	Notes
5	Sword Cane	thr imp	C, 1	-2F	$600	1.5	5	

TONFA (DX-5 or Shortsword-3)

TL	Weapon	Damage	Reach	Parry	Cost	Weight	ST	Notes
7	Tonfa	sw cr	1	0	$40	1	7	[3]
	or	thr cr	C, 1	0	–	–	7	

Notes:

[1] Attack receives Brawling or Karate damage bonuses.

[2] On a failed HT roll, victim is stunned for as long as weapon is in contact plus (20 - HT) seconds longer, and can then roll vs. HT-3 to recover.

[3] Use Brawling or Karate parry if better than usual weapon parry.

The rifle is the first weapon you learn how to use, because it lets you keep your distance from the client. The closer you get to being a pro, the closer you can get to the client. The knife, for example, is the last thing you learn.

– Léon, ***Léon***

Muscle-Powered Ranged Weapons

Though eclipsed by firearms, muscle-powered ranged weapons still show up at TL5-8 for hunting, sports, and even combat. The information below applies only to the high-tech versions of such hardware. For more low-tech weaponry and related rules, see ***GURPS Martial Arts.***

Bows and Crossbows

Bows and crossbows at TL5-6 are largely identical to those of lower TLs. By TL7, improved materials and accessories make archery an increasingly popular pastime. Bowhunting enjoys a revival on land, while the speargun takes the sport beneath the waves.

Compound Bow (TL7). Invented in 1966, the compound bow uses pulleys and cables to store and transmit energy more efficiently. It requires less strength from the archer, yet has greater range. Any type of bow other than a composite bow (see p. B275) can be made this way. A compound bow shoots as if its ST were two points higher; e.g., a ST 11 compound longbow has damage and range for ST 13, but a ST 11 person can draw it. Double cost. LC4.

Compound Crossbow (TL7). Any type of crossbow (see p. B276) can be built to take advantage of compound-bow technology, with identical benefits: +2 to ST for damage and range without increasing draw strength. Double cost. LC4.

Slingshot (TL7). A rubber-powered, wrist-braced slingshot can easily kill small animals; headshots are dangerous to humans, too. Some models fold (Holdout -1). Ammunition is easily scavenged in most places; heavy steel ball bearings are most popular. Slingshots require the Bow (Slingshot) skill, a new specialty of Bow (p. B182). LC4.

Speargun (TL7). A speargun is for hunting fish and defense against aquatic predators. It most commonly relies on thick rubber bands to propel the spear, but some models use compressed air. Divide range by 10 in water; however, line length is usually the more stringent limit, as the spear is normally fastened to the gun by no more than 30' (10 yards) of line. See *Harpoons* (p. B411) for rules for tethered spears. Spearguns use the Crossbow (Speargun) skill, a new specialty of Crossbow (p. B186). LC4.

Thrown Weapons

The only thrown weapons likely to be encountered at TL5-8 are knives (see p. B276) and hatchets. These are considered fine at TL7-8 (p. B274) and have the same materials options as melee weapons (see *Blade Composition,* p. 198).

Bow Accessories (TL7)

Bows at TL7-8 can have adjustable sights, wind gauges, stabilizers, rangefinders, and so on. These give +1 Acc in the hands of a skilled user and add $100 to the bow's price. An archer unfamiliar with such devices suffers -1 to skill for using a bow burdened with them! Bows can also take advantage of various sighting aids, just like guns (see *Sights and Aiming Aids,* pp. 155-157); targeting lasers aren't uncommon.

Bowstring silencers – small leather or rubber pieces – reduce the noise of the bowstring twang (-2 to Hearing). $1 (pair), neg. LC4.

Crossbow Accessories (TL7)

Crossbows can mount the same scopes, collimating sights, and targeting lasers as firearms; see *Sights and Aiming Aids* (pp. 155-157).

Muscle-Powered Ranged Weapon Table

See pp. B268-271 for an explanation of the statistics.

BOW (SLINGSHOT) (DX-5 or Bow-4)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	Cost	ST	Bulk	Notes
7	Slingshot	1d-1 cr	1	60/100	1/0.05	1	1(2)	$15	6†	-2	[1]

CROSSBOW (SPEARGUN) (DX-4 or Crossbow-4)

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	Cost	ST	Bulk	Notes
7	Speargun	1d imp	2	100/150	3.5/0.4	1	1(10)	$100	8†	-6	[2]

Notes:

[1] Can fire stones (TL0), lead bullets (TL2), or steel balls (TL5). Stones are free. A lead or steel projectile is $0.1, and gives +1 damage and *double* range.

[2] A spear is $10. Divide range by 10 underwater.

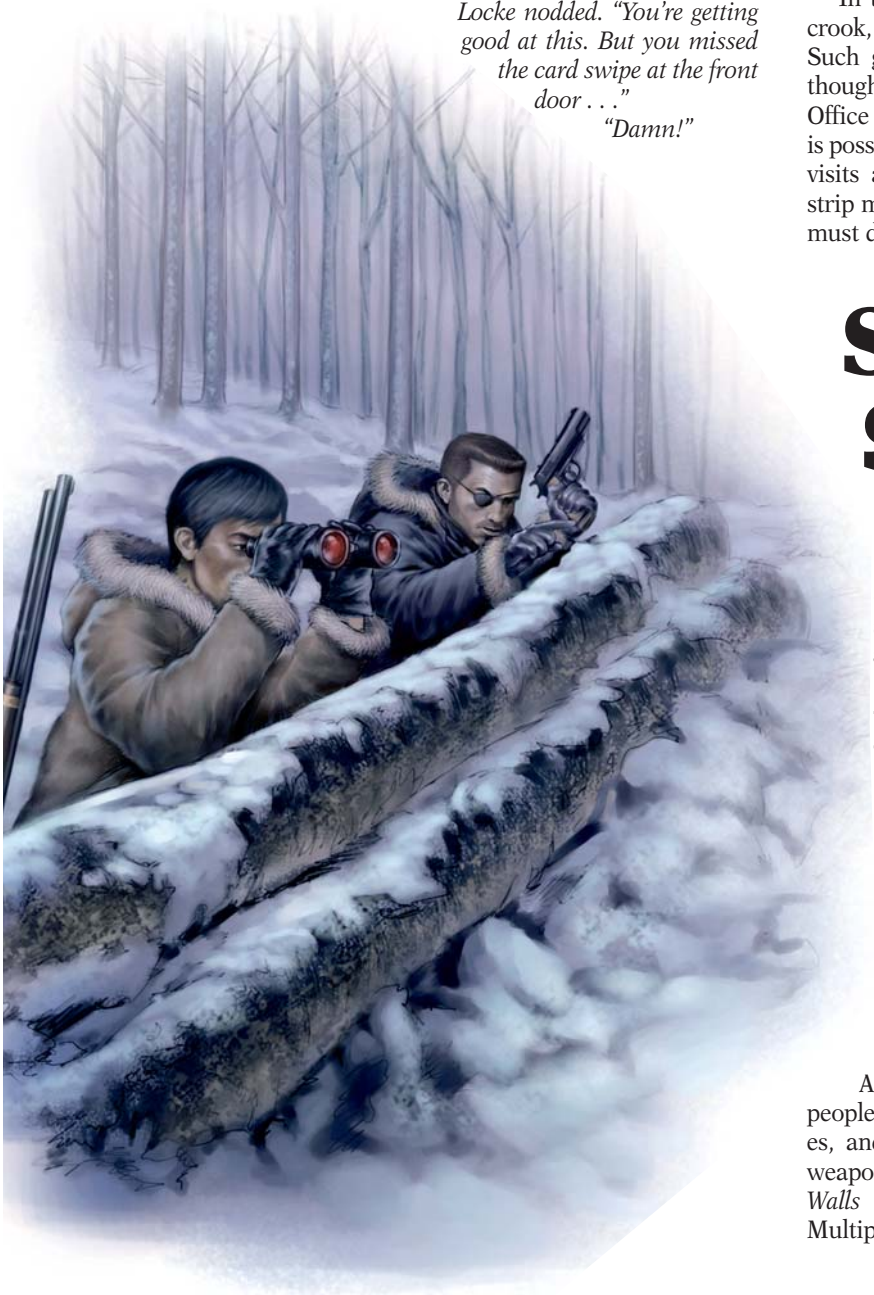
Chapter Six
Covert Ops and Security

Locke handed the binoculars back to Nat. "How's Airk?"

"He's tough. He'll recover, but he needs some rest." Nat peered through the binoculars. "I count three men, visibly armed. Two antennas. Looks like security cameras on the water tower and the grain silo. And I'm betting the barbed wire is a smart fence."

Locke nodded. "You're getting good at this. But you missed the card swipe at the front door . . ."

"Damn!"



" . . . and the acoustic sniper detection array on the birdhouse."

"Double damn!"

Locke patted the big Indian on the shoulder. "Come on. Let's go check on sleeping beauty."

In the battle of spy vs. spy or lawman vs. professional crook, specialized tools can matter more than firepower. Such gadgetry rarely comes from the local chain store, though! A CIA officer procures his equipment from the Office of Technical Services, whose motto is "Imagine what is possible – then prepare to be amazed." A private detective visits a dubious "electronics shop" in an out-of-the-way strip mall. With this gear more so than with most, the GM must decide what's available to whom, and at what price.

Security and Surveillance

Adventurers often find themselves using or confronting technologies designed to keep valuables *in* and unwanted visitors *out,* or to track the movement of goods and people. Whether the goal is security or surveillance, it's usually more effective to layer several *different* systems.

Barriers and Traps

Those in the business often speak of physical security as "the four Ds": *deter, detect, delay,* and *defeat.* Barriers delay the intruder from reaching his objective; he must waste time going over or around them. Traps defeat him by rendering him ineffective – or less effective – as a threat, but are rare in reality because they're so indiscriminate. Either measure can also deter, if sufficiently visible.

Armored Doors (TL5)

A sturdy door with a lock is the simplest way to keep people out. Napoleonic-era redoubts, inner-city crack houses, and modern high-security installations (e.g., nuclear weapons facilities) all sport armored doors. See *Doors and Walls* (p. B558) for the DR and HP of armored doors. Multiply HP by the door's width in yards. LC4.

Locks (TL5)

Key locks and combination locks are the most widespread protection against theft and unwanted tampering. Locks have three defining traits: *toughness, quality,* and *TL.* These vary independently; one could have a weak, fine TL5 lock, a tough, basic TL8 lock, and so on. All locks are LC4.

Toughness: Locks are Unliving, with HP based on weight; see the *Object Hit Points Table* (p. B558). The lock's exterior determines how easy it is to break:

- *Weak.* Made of plastic or low-grade metal, this lock is easily smashed with a hammer blow. DR 3, HP 2. $5, 0.25 lb.
- *Standard.* Constructed of steel, this is the typical TL5-8 lock. DR 6, HP 3. $20, 0.5 lb.
- *Tough.* An industrial-grade model, in hardened or tempered steel. DR 12, HP 3. $100, 0.5 lb.

Quality: A thief who can't break the lock (or who wants to be stealthy!) may try to pick it. The quality of the mechanism affects his odds of success:

- *Basic.* Lockpicking attempts are at +5. ×1 cost.
- *Good.* No Lockpicking modifier. ×5 cost.
- *Fine.* Lockpicking attempts are at -5. ×20 cost.

Tech Level: Lock manufacturers keep the latest designs secret, but often release information on older models to legitimate locksmiths or training schools. Higher-tech burglars therefore get a *bonus* equal in size to the penalty under *Tech-Level Modifiers* (p. B168); e.g., a TL7 thief has +3 to pick TL5 locks and +1 to pick TL6 locks. It's entirely possible to find low-tech locks without traveling back in time! An abandoned mine shaft or a Third World warehouse is likely to have a lock from an earlier TL.

Safes (TL5)

Safes are solid boxes with locks and other security devices, designed to protect valuables. Modify a safe's price for the quality of its lock; see *Locks* (see above). Ignore the lock's toughness – use the *safe's* DR.

Base time to open a safe is an hour, not the minute needed for most locks (see *Lockpicking,* p. B206). Modify this for *Time Spent* (p. B346): bonuses for a basic lock, superior tools, etc., let the safecracker work quickly, while the penalty for a fine lock means he may require extra time. A stethoscope (pp. 213, 222) – to listen to the internal mechanism – is basic equipment for safecracking.

Bank Safe (TL5). A typical freestanding safe for a small business or a bank. 3 cubic feet. DR 120, HP 73. $5,000, 750 lbs. LC4.

Bank Vault (TL5). A small walk-in vault at a branch bank. 50 cubic feet. DR 400, HP 127. $30,000, 2 tons. LC3.

Depository (TL5). A huge safe at a large bank, or a national depository. 500 cubic feet. DR 800, HP 345. $300,000, 40 tons. LC3.

Fire Safe (TL5). A small, portable safe for documents and other small, high-value items. May be hidden; e.g., in a wall behind a picture. 1.2 cubic feet. DR 20, HP 19. $100, 100 lbs. LC4.

Firearms Safe (TL5). Holds a dozen rifles and like number of pistols. 20 cubic feet. DR 80, HP 64. $1,000, 500 lbs. LC4.

Traps (TL5)

Sometimes, the best defense against an intruder is to neutralize him with a trap. To *set* and *conceal* a trap, roll against the Traps skill (p. B226). The Camouflage skill (p. B183) can also hide a trap, if outdoors. To *spot* a hidden trap, make a Per-based Traps roll, adjusted for standard Vision modifiers (e.g., darkness).

While parts for these traps are LC3-4, *setting a trap* has a lower LC in most places!

Stake Pit (TL0)

This is simply a covered, stake-filled hole. A common jungle trap during the Vietnam War was the *punji* pit: a knee-deep hole containing sharpened lengths of excrement-smeared bamboo (-2 or worse on rolls to avoid infection; see *Infection,* p. B444). The victim of a punji pit suffers thrust impaling damage based on his *own* ST. Cost is negligible. LC4.

Tripwire (TL0)

A tripwire is a line strung across a path – frequently with one end attached to an alarm or an explosive (see *Hand-Grenade Booby Trap,* p. 190). Roll as usual to spot this trap, but at an extra -2 if it's made of nylon fishing line or similar "invisible" material. An unseen tripwire trips the victim unless he can make a DX-2 roll. Cost and weight are negligible. LC4.

Caltrops (TL5)

A *caltrop* consists of four sharp metal spikes joined at the base and directed to the vertices of a tetrahedron so that one always points up. Called "crow's feet" during the American Civil War, caltrops are designed to discourage pursuit and slow movement.

Anyone in a caltrop-strewn area must make a Vision roll once per second while moving. Apply the speed penalty for his Move (p. B550); e.g., Move 5 gives -2. He has a further -2 if not specifically watching the ground. Failure means he steps on a number of caltrops equal to his margin of failure (minimum one).

Each caltrop inflicts thrust-3 impaling damage, based on the *victim's* ST, on the foot. The DR of footwear protects normally. Injury can cripple the foot (see *Effects of Crippling Injury,* p. B421) – but even if it doesn't, damage equal to or greater than DR means the caltrop has become lodged and will inflict damage every turn if walked on. Removing each caltrop takes two Ready maneuvers. Caltrops are sometimes poisoned or covered in dung (-2 or worse on rolls to avoid infection; see *Infection,* p. B444).

Enough caltrops to cover a hex on a combat map: $1, 0.5 lb. LC4.

Electromagnetic Car Stopper (TL8)

This device uses an electromagnetic pulse to disable the electronic ignition and engine-control systems of TL8 automobiles. Only vehicles that drive over the car stopper are affected. Thus, it's usually a permanent installation, hidden under the pavement on an access route to a sensitive area.

Treat this as an Affliction that only affects electronics and those who have the Electrical disadvantage (p. B134). Targets must make a HT-8 roll or be knocked out of action for seconds equal to margin of failure. Pre-TL8 vehicles are immune because they don't rely on electronic systems to stay running! $10,000. LC3.

Spike Strip (TL8)

A spike strip is a portable, single-use device consisting of hollow metal quills in a lightweight plastic strip. If a car drives over it, the spikes will puncture a tire and deflate it in five seconds (which is usually gradual enough to prevent a crash). This gives -4 to Driving rolls and *halves* the car's Top Speed. Per yard: $100, 1 lb. LC3.

Electronic Locks (TL6)

Electronic locks use numeric keypads or magnetic-strip key cards to control access. They're mounted on doors, consoles, and even briefcases. They come in the same quality grades as mechanical locks, with identical effects on price; see *Locks* (p. 203).

"Picking" an electronic lock requires either Electronics Repair (Security) tools (see *Tool Kits,* p. 24) or an electronic lockpicking kit (p. 213). A less-invasive way to bypass a keypad is to observe an authorized user during the activation sequence and write down his code. Another method is to wipe off the keypad, wait for a user to enter his code, sprinkle some fingerprint powder to reveal the keys he used, and (eventually) figure out the right sequence.

Intruders may attempt to cut the power on electronic door locks. This often *does* work. Most systems are designed to unlock if the power fails – a safety measure in case of fire or other emergency. Such locks are "fail safe." Devices that lock when the power goes off are "fail secure," and found mainly on prison doors, the cases of high-value items, etc.

A *basic* electronic lock (+5 to Lockpicking attempts) – typical of homes, hotel rooms, shipboard staterooms, etc. – is a relay-based keypad at TL6, an electronic keypad at TL7, or a card reader at TL8. $100. LC4.

Security Fences (TL6)

Fences serve as a visible reminder that an area is off-limits, and can slow or stop trespassers. At TL7-8, invisible "fences" aim instead to *detect* intruders.

Barbed Wire (TL6)

The first barbed wire was sold in the 1870s on the American Plains. Settlers' efforts to stop free-range cattle from destroying their crops became the "Barbed Wire War," and cowpokes referred to the stuff as "the Devil's rope." The military quickly adopted barbed wire, using it for defensive barriers during the Spanish-American War. Barbed wire played a significant role in the carnage of WWI, too; it slowed down Tommy, Doughboy, and Landser so they could be mowed down by machine-gun fire.

A typical unit of coiled or "concertina" fencing stretches up to 15 yards when uncoiled and stands a yard tall. It's freestanding and easily curved to create an enclosure or defend an oddly shaped area. Adding stakes or similar fixtures makes the barrier more permanent, while stacking multiple layers gives extra protection. Barbed wire takes one man-minute per yard to deploy – or *triple* that if protective gloves, wire cutters, and fasteners aren't available.

Anybody passing through barbed wire has to make a DX-5 roll once per yard. Failure means the barbs tear the victim's skin; he must make a Will roll (at +3 for High Pain Threshold or -4 for Low Pain Threshold) to avoid crying out. The wire also snags clothing and equipment; treat it as a Binding (p. B40) with ST 8. The easiest way to cross barbed wire is simply to lay something over it – a log, a sheet of metal or thick plastic, a body – and climb across.

Barbed Wire (TL6). Per 15-yard coil: $100, 15 lbs. LC4.

Razor Wire (TL6). Also called *razor tape,* this is wire-reinforced stainless-steel tape with spikes. Invented during WWI, it entered wide use in the 1960s, slicing inmates and Viet Cong sappers to ribbons. Treat it exactly like barbed wire, but a failed DX-5 roll also does 1d-3 cutting damage, and the ensuing Will roll suffers a penalty equal to the injury. Per 15-yard coil: $200, 15 lbs. LC4.

Electric Fences (TL6)

Nonlethal electric fences for livestock control appeared in the 1930s, one of the earliest examples being jury-rigged from Model T parts by a New Zealander. They proved successful at containing animals, and were soon adopted for caging humans. This led to the development of *lethal* electric fences, such as those found at Nazi concentration camps.

Electric fencing can be combined with barbed wire (see above).

Cattle Fence (TL6). A "hot wire" livestock fence inflicts a continuous "zap" for as long as the intruder touches it. Roll vs. HT each second. Failure means the target is stunned while he remains in contact with the fence. After breaking contact, he may roll versus HT each second to recover. See also *Nonlethal Electrical Damage* (p. B432). An electric-fence control box and 1/4 mile of three-wire fence: $1,000, 400 lbs., external power. LC4.

Lethal Fence (TL6). A lethal electric fence, such as DeTekion's Electro-Guard 5000, is sometimes used at "super-max" prisons. It inflicts 3d burning damage per second; see *Lethal Electrical Damage* (p. B432). At TL8, it can be programmed to deliver a nonlethal shock (above) first, which then arms the fence as lethal. This is a safety of sorts: the fence doesn't injure those who touch it accidentally but *kills* anyone who tries to climb it. A control box and 1/4 mile of fence: $10,000, 500 lbs., external power. LC2.

Laser Fence (TL7)

A laser "fence" is actually a screen of IR laser beams. These are invisible to the naked eye but *not* to night-vision gear. Breaking a beam activates an alarm.

Laser Fence (TL7). A collection of emitters and receivers built into fence posts, doorways, corridors, etc. $100 per yard, external power. LC4.

Laser Fence (TL8). A single IR laser emitter that can protect a wall up to 30 yards tall and 100 yards long. $2,500, external power. LC4.

Proximity Fence (TL7)

This capacitance proximity sensor consists of two buried, parallel lines. When energized, these project a field (detectable with an EM field meter, p. 50) that can detect human movement within 3-5 yards. Pole-vaulters and tunnelers should note that this includes *above* and *under* the lines! This technology can be built into an actual fence, but it's typically used alone, providing an invisible perimeter where conventional security fencing would be an eyesore. Per foot: $20, 1 lb., external power. LC4.

Microwave Fence (TL8)

This stationary radar transmitter-receiver pair detects movement in a 10-yard-wide swath between the two units, which can be placed up to 500 yards apart. See *Radar* (pp. 46-47) for general radar capabilities and limitations. $5,000, 20 lbs., external power. LC3.

Smart Fence (TL8)

These sensors attach to the posts of any wire fence, including an electric fence. They detect any attempt to cut, climb, or lift the fence, and report the nature and location of the breach. An Electronics Operation (Security) roll at -4 is required to neutralize each section. Each package of sensors covers a 10-yard section of fence: $25, 1 lb., external power. LC4.

Remote-Controlled Weapons (TL8)

A gun can be connected to sensors and controlled from a remote workstation. An example is TRAP (Telepresent Rapid Aiming Platform), tested by the U.S. Army, which mounts a machine gun or a semiautomatic rifle on a motorized tripod. It can be fitted with a wide range of passive visual sensors (pp. 47-48). Such a system might be mounted high up – e.g., on a light pole or a tall building – to cover a wide area. Weapon, sensors, and ammunition (up to 40 lbs. total) must be purchased separately, and are protected by an armored box (SM -2, DR 35, HP 8). $150,000, 100 lbs., L/24 hrs. LC2.

Security Systems

A well-designed security system combines several layers of identity verification with multiple intrusion-detection measures in order to deter and/or detect would-be thieves and spies. Security is a comfort-dependent technology, though – people put up with it as long as it doesn't cause too much inconvenience. Even *security personnel* will ignore a device that causes frequent false alarms, malfunctions regularly, or is otherwise fussy. As well, while security equipment is designed to minimize or eliminate "false positives," sensitive gear is bound to detect things that aren't threats; e.g., a metal detector will sense a wristwatch or a fountain pen as easily as it will find a knife or a handgun. Crafty operatives can exploit these flaws, using "human engineering" to ensure that security systems are ignored or even shut off in the highest-security areas ("Aw, that's just the south door alarm going off again. Third time today, as a matter of fact. Don't worry about it. Hand me another egg roll . . .").

Identity Verification (TL5)

The first rule of security is *access control:* separating the authorized from the unauthorized to make intruders easier to find. Locks (p. 203) at TL5+ and electronic locks (p. 204) at TL6+ are effective means of access control. So is a guard!

At TL8, electronic locks capable of identify verification appear. Someone with suitable tools and unobserved access to such a device can crack open its case and bypass it with an Electronics Operation (Security) roll, at +5 for a *basic* system (×1 cost), no modifier for a *good* system (×5 cost), or -5 for a *fine* system (×20 cost).

Fingerprint Scanner (TL8)

This scans the subject's fingerprint or hand geometry. Basic versions are easy to fool: breathing heavily on the scanner causes the machine to read the last print scanned – which, if authorized, grants admission! Tricking higher-quality scanners is difficult but not impossible. $200, 1 lb., external power. LC4.

Retinal Scanner (TL8)

A retinal scanner uses a low-powered laser to identify the subject's unique retinal pattern. Surgery and special contact lenses are ineffective in reality, but might work in cinematic campaigns. $500, 2 lbs., external power. LC4.

Signature Pad (TL8)

This device senses timing and pressure as the user signs his name on a pressure-sensitive plate. It can see through simple forgery attempts, but someone with the Electronics Operation (Security) skill *and* a computer analysis of an authorized signature may attempt a Forgery roll at -3. $200, 2 lbs., external power. LC4.

Voiceprint Analyzer (TL8)

A voiceprint analyzer matches the subject's voice to an audio record (usually a short phrase such as a name or an ID number). A good digital recording of the phrase will easily bypass the system; a voice modulator (p. 212) can also fool it. $100, 0.5 lb., external power. LC4.

Intrusion-Detection Systems (TL6)

These systems detect unauthorized activity and notify the authorities via local and/or remote alarms. Responses vary. Residential security services often dispatch their own personnel and call the police; military setups alert armed troops.

Make a Vision-5, Observation, or Per-based Traps roll to *spot* an intrusion-detection system. If it's concealed, this becomes a Quick Contest against Camouflage skill, and discovery may be impossible without suitable sensors (e.g., a thermograph to see the heat in the wiring). Make an Electronics Operation (Security) or Traps roll to *identify* any hardware found.

Defeating the system may require one or more skill rolls. See below for some possible approaches. The GM decides what strategies are effective against a given setup. In all cases, thwarting a mechanical device or a simple circuit calls for a Traps roll, while anything more sophisticated requires an Electronics Operation (Security) roll. *Any* failure sets off the alarm. The GM should roll in secret; even if the alarm involves a loud siren, the intruders needn't know until they trip it!

One possible way to disarm a system is to gain access to the controls and shut it down. This still demands a skill roll. Nearly all setups require codes, keys, and/or supervisor permission to deactivate without arousing suspicion.

If a security device is accessible, a skill roll can open and disable it. However, most hardware is wired to detect tampering. The GM should require a *separate* skill roll to open the housing without triggering the alarm.

In the movies, heroes routinely *destroy* security devices – often with pistol fire. This shouldn't work in a realistic game. Good-quality systems are rugged enough to resist handgun rounds (DR 12+). Shooting them counts as tampering *and* tends to alert anyone nearby!

Since most systems draw external power from the building in which they're installed, cutting the power might seem logical. Modern devices inevitably have battery backups, though; some have one per sensor, just in case. These can often provide power for hours, even *days*.

In the final analysis, the safest way to defeat any system is to have someone on the inside!

An intrusion-detection system may include any of the elements below – and possibly a laser fence (p. 204), proximity fence (p. 205), microwave fence (p. 205), and/or smart fence (p. 205). To work as a *system* rather than as a set of components, it requires monitoring equipment or software, which costs $1,000 or more (GM's discretion). At TL6-7, monitoring equipment consists of bells, claxons, and/or blinking lights. At TL8, devices are often connected to a computer with powerful monitoring software, which might call a whole list of people via radio and cell phone, leave messages, send e-mail, notify emergency services, etc.

Electric Alarms (TL6)

These are simple switches and latches that activate an alarm when tripped. They're common on windows and doors, often alongside locks (p. 203), electronic locks (p. 204), or identity verification (p. 205). At TL6-7 they're connected by wire to a monitoring box. At TL8, they can communicate via a wireless network. Per portal: $200, neg., external power. LC4.

Proximity Detector (TL7)

Capacitance proximity sensors detect minute changes in an electric field – such as those caused by an approaching intruder. Touch-sensitive consumer products, like lamps, use similar sensors at TL8. Typically concealed, proximity detectors are connected directly to a high-value object: technological prototype, sculpture, frame of a painting, etc. Touching the rigged item triggers the alarm. Per item: $40, neg., external power. LC4.

IR Motion Detector (TL8)

This sensor detects motion up to 25 yards away and is often combined with directional lights. $100, 1 lb., external power. LC4.

Seismic Detector (TL8)

This buried vibration sensor can discriminate between people, vehicles, and geological phenomena. Its detection radius is five yards. By making a Stealth roll at -4, an intruder who's aware of the device can cross the protected zone at Move 1 without being detected. $50,000, 50 lbs., external power. LC3.

Screening Systems (TL7)

Visitors to restricted areas are often scanned for threats during or after identity verification. A screening system's operator must make an Electronics Operation (Security) roll to claim any bonuses his hardware grants.

Security Metal Detector (TL7)

A handheld metal detector of the type used by security guards and police at concerts, public gatherings, and so on gives +1 on Explosives (EOD), Search, and Traps rolls to detect metallic objects: guns, knives, mines, bombs, etc. Combined with a one-minute pat-down, the Search bonus becomes +2. Clothing designed to conceal items (see *Undercover Clothing,* p. 64) is ineffective against a detector-assisted search!

Handheld Metal Detector (TL7). $500, 1 lb., S/10 hrs. LC4.

Handheld Metal Detector (TL8). $250, 1 lb., S/10 hrs. LC4.

Video Surveillance Cameras (TL7)

A security camera doesn't provide much protection; it simply records the crime. The recording is all but useless if the perpetrator wears a mask or hides his face. Still, many people feel safer with cameras around.

The statistics below assume a basic, stationary color video camera – the most common variety. *Triple* cost and weight for a "PZT" model that can pan, tilt, and zoom when controlled from a remote workstation. Add $100 to final cost for a wireless camera with a half-mile range.

Video Surveillance Camera (TL7). $150, 2 lbs., external power. LC3.

Video Surveillance Camera (TL8). $150, 1 lb., external power. LC3.

Walkthrough Metal Detector (TL7)

A walkthrough metal detector is a large portal for screening people entering airports, museums, and the like. The operator can adjust its sensitivity to get from +1 to +3 to Search in Quick Contests against Holdout. The higher sensitivity levels are unsuitable for use in high-traffic areas, though – an alert almost always leads to a pat-down (usually with a handheld detector, see above), so higher sensitivities mean longer lines filled with grumpier people.

Walkthrough Metal Detector (TL7). $10,000, 100 lbs., external power. LC4.

Walkthrough Metal Detector (TL8). $5,000, 50 lbs., external power. LC4.

X-Ray Baggage Screeners (TL7)

These X-ray machines are designed to scan luggage or packages carried on a conveyor belt. They give +3 to Search to detect weapons, contraband, and the like. At TL8, they provide color-coded images: organic material appears brown or bright orange, metal is light green to dark blue, etc. This gives a *further* +1 to Search to detect metallic weapons, detonators, and explosives.

Carry-On Baggage Screener (TL7). $50,000, 1,000 lbs., external power. LC3.

Hold Baggage Screener (TL7). $100,000, 1 ton, external power. LC3.

Pallet or Cargo Container Screener (TL7). $200,000, 3 tons, external power. LC3.

CT Scanner (TL8)

At TL8, specially designed CT scanners (see *CT and MRI Scanners,* p. 223) are the primary means of screening hold baggage at the world's major airports. They're the only alternative to a manual search authorized by the U.S. Transportation Security Administration. A CT scanner generates a 3D model of the baggage based on the density of its contents. It's the "best equipment possible" for Search at TL8, giving +4 (quality) for all searches and +6 (quality) to find explosives. $2,000,000, 6 tons, external power. LC3.

Millimeter-Wave Camera (TL8)

This "radar camera" detects the radiation emitted by all objects – including people – and can see through clothing, foliage, packaging, and thin walls. A guard can use it to spot weapons and other contraband by watching people as they approach or move through a checkpoint. It provides Imaging Radar (p. B81) with a 10-yard range. $100,000, 50 lbs., external power. LC3.

Optical Recognition Software (TL8)

This software compares a subject's face or gait to a database, alerting security staff if that person isn't on a list of authorized personnel – or *is* on a "watch list." Effectiveness is hotly debated. A conservative approach would treat it as a guard with an effective Perception roll of 14 for recognition purposes; a more generous approach would give it Per 18+. The Disguise and Acting skills can fool optical recognition software about as easily as they would a guard. The software requires video surveillance cameras (p. 206) for input and can monitor up to 10 cameras simultaneously. Complexity 5. $10,000. LC3.

Acoustic Countersniper System (TL8)

This system swiftly triangulates the origin of a gunshot. Its omnidirectional microphones detect the shockwaves generated as the bullet travels through the air. Using this sensor data, and a location package that includes a GPS receiver (p. 53) and a compass, the computer at the system's heart calculates the bullet's speed, distance, trajectory, and caliber – and, most important, the *firer's* location – all within a second.

The system is extremely accurate; its margin of error is smaller than 10%. It can determine caliber and range, and fix direction to within 20°. Roll at 10 plus the total Hearing modifier for the weapon's type, ammunition, distance, suppressor, etc., to see if it can locate the shooter. For more on detecting gunshots, see *Sound Suppressors* (pp. 158-159). $10,000, 30 lbs., M/10 hrs. LC3.

Eye in the Sky

Military and intelligence operatives – and skilled cinematic hackers – may get the opportunity to scope out the opposition using "intelligence assets" such as spy satellites and surveillance drones. Civilian experts use lower-resolution satellites to plan urban growth, watch the weather, and study climate change.

The best-known spy satellites are *imagery satellites,* which use cameras and other sensors to render an image. At TL7, resolution of the traditional spy-satellite camera is about a yard, meaning it could clearly see a semi-truck, mobile missile launcher, house, or research lab . . . but not a car or a person. At TL8, the sharpest "eye in the sky" might resolve pixels of 4"-6" – a softball-sized target. That *still* isn't good enough to read the proverbial newspaper from orbit, but it's more than enough to differentiate between, say, a man and a woman, or an adult and a child. Radar, thermal, and hyperspectral sensors allow satellites to see through foliage, detect whether a factory is operating, or even look underground.

An imagery satellite has limits, though. It shoots pictures from directly above, so reading a license plate is impossible unless the plate is on the hood of the car! The satellite travels at several *miles* per second as it passes overhead, reducing its time over the target to bare minutes; its orbit might bring it over the target from twice a day to only once every three days. On each pass, it views a comparatively small area – 100 square miles or less. These problems mean that spy satellites are less all-seeing eyes than just one of several means of gathering data.

Those running *realistic* technothriller games should also know that real-time video – as depicted in the movie *Enemy of the State* – is unlikely. At TL7, satellite imagery is delayed by several days to a week because the film capsule must be dropped from the orbiting satellite, reenter, and then be recovered and processed! At TL8, digital pictures are relayed to communications satellites, so only a few minutes pass between when an image is taken and when it's delivered to those who need it. But it still isn't real-time video.

Real-time video is most likely to come from spy planes – or, at TL8, from unmanned aerial vehicles (UAVs) such as Predator and Global Hawk. Such craft can fly high enough to be virtually undetectable by ground observers, and for long enough to snoop around an area for *dozens* of hours. Speed seldom exceeds 100 mph, which is another plus.

Most spy satellites have Telescopic Vision 10-15 (black-and-white only, at TL7). Gathering good-quality satellite imagery requires an Electronics Operation (Sensors) roll, but determining what the image reveals requires the Intelligence Analysis skill. President John F. Kennedy stared blankly at the unprocessed images he was given during the Cuban Missile Crisis; he saw only an empty field until image analysts explained what was there.

Surveillance and Tracking Devices

For basic surveillance tools, see *Media* (pp. 40-45) and *Sensors and Scientific Gear* (pp. 45-50). The equipment below is more specialized. It has few applications beyond what the U.S. Intelligence Community calls "technical intelligence gathering": procuring information ("dope") through technological – commonly *electronic* – means.

Surveillance devices are often LC3-4 but treated as having a lower LC if put to illegal use.

Audio Surveillance Devices (TL6)

Audio surveillance experts skilled at gaining access to critical areas are called "inside men" or "bag men." They may use stolen uniforms, acquire temporary jobs with custodial services, or sneak in through open windows. Another strategy is to carefully disguise bugs in everyday items presented as gifts. During the 1960s, the president of South Vietnam, Nguyen Van Thieu, was given color televisions and other American-made electronics outfitted with audio surveillance gear. Whatever the means, the goal is to plant a listening device and gather good intelligence.

The true expert has many different types of bugs in his kit. All of this gear uses the Electronics Operation (Surveillance) skill.

Phone Tap (TL6)

The classic "wiretap" listens into the phone line *outside* a building, allowing surveillance of a phone within the building without setting off bug detectors (p. 212). This might involve cutting and splicing into the line, but often relies on an inductive coil that detects the signal noninvasively. Detecting a phone tap is almost impossible.

At TL6, a wiretap connects via a length of wire to a handset, allowing agents to listen in at the junction box or run a line to their vehicle or a nearby room. At TL7, it can use an A/V transmitter (p. 209). At TL8, it can be programmed for a specific voiceprint, timeframe, etc. Taps can be configured to monitor fax and computer communications over phone lines. $100, neg. LC3.

Audio Bugs (TL7)

Audio bugs pick up sounds and transmit them to a receiver up to half a mile away. They're about as sensitive as the human ear. When worn covertly, a bug is sometimes referred to as a "wire."

Audio Bug (TL7). SM -9. $100, neg., T/week. LC3.

Audio Bug (TL8). Voice-activation (VOX) circuitry keeps the bug from operating during periods of silence, greatly conserving battery power. SM -13. $100, neg., T/month. LC3.

Contact Mike (TL7)

This is a small (SM -11), disk-shaped microphone with an adhesive backing. Attached to a window, wall, etc., it lets the operator pick up sounds on the far side by making an Electronics Operation (Surveillance) roll at a penalty equal to the barrier's (DR + HP)/5, rounded down. $40, neg., T/week. LC3.

Laser Mike (TL7)

A laser mike turns any window into a bug by reflecting an invisible laser beam off the glass and picking up the vibrations caused by speech within the room. Very heavy curtains or triple-glazing might defeat this method; a white noise generator (p. 213) certainly will. Even *ordinary* noise – loud music, running faucets, etc. – is effective against TL7 models, but TL8 units can filter this out. Most bug detectors (p. 212) can't sense laser mikes. Range is 300 yards at TL7, 900 yards at TL8. $5,000, 2 lbs., external power. LC3.

Pinhead Mikes (TL7)

The audio equivalent of an endoscope (p. 209), a pinhead mike is a *tiny* (SM -16) microphone on a flexible cable that can be snaked under doors, through ductwork, etc. Make a DX-based Electronics Operation (Surveillance) roll to guide the cable. Failure means the mike gets stuck or makes noise. Critical failure means it breaks or is detected by the target.

Pinhead Mike (TL7). About as sensitive as the human ear. Powered by the tape recorder, transmitter, or other device to which it's connected. Has an 8-yard cable. $20, neg. LC3.

> *Okay, boss, this LTX-27 concealable mike is part of the same system that NASA used when they faked the Apollo moon landings.*
>
> *– Mother,* ***Sneakers***

Laser Pinhead Mike (TL8). This consists of a plastic diaphragm on the end of an optical fiber. Sounds vibrate the diaphragm, a laser reflected off the diaphragm via the fiber picks up the vibrations, and then the light pulses are converted back to sound. The laser mike (above) uses the same principle. This device won't trigger bug detectors or metal detectors; only a physical search reveals it. Otherwise, it's identical to a regular pinhead mike. $400, neg. LC3.

Spike Mikes (TL7)

A pinhead mike (above) can be mounted in a spike rather than on a cable. The user pushes it *through* a wall and into contact with the wall of an adjacent room. The target wall acts as a giant sounding board, giving (TL-4) levels of Parabolic Hearing (p. B72). Otherwise, treat the device as a pinhead mike.

Spike Mike (TL7). $50, 0.5 lb. LC3.

Laser Spike Mike (TL8). $450, 0.5 lb. LC3.

Signals Intelligence Monitoring (TL6)

Signals intelligence (SIGINT) is the interception, identification, and analysis of radio emissions. The DEA uses SIGINT equipment to monitor drug cartels in Central and South America. Most U.S. embassies are equipped with a Special Collection Element: a joint CIA-NSA operation that eavesdrops on local radio and cellular traffic.

This equipment uses the Electronics Operation (EW) skill, which defaults to Electronics Operation (Comm)-4.

Radio Intercept (TL6)

Radio eavesdropping requires a radio receiver with the "radio intercept" option; see *Radio* (pp. 37-40) for statistics. Using such equipment to listen in on random, unencrypted traffic in range (cell phones, cordless phones, handheld radios, etc.) is a routine task. Roll against Electronics Operation (Comm or EW) at +4, should it matter. Encrypted signals can be recorded and decoded later.

To intercept a *specific* signal, the spy must know its frequency. If he doesn't, he'll have to conduct a "freq search" while the transmitter is broadcasting. Each attempt requires an Electronics Operation (EW) roll and 15 minutes at TL6, five minutes at TL7, or five seconds at TL8. Success allows routine monitoring of later transmissions on that frequency. If the transmitter's operator is actively seeking to avoid interception, this becomes a Quick Contest of Electronics Operation (EW); victory lets the interceptor eavesdrop on that one transmission. LC3.

Cellular Monitoring System (TL8)

This is a specialized radio receiver for intercepting cellphone traffic. It can monitor up to four calls at a time and log everything to a hard disk, prevent the target phone from receiving incoming calls, jam the phone outright, and trace calls. The system comes in a large attaché case. $20,000, 7 lbs., external power. LC2.

Visual Surveillance Devices (TL6)

Visual surveillance experts use regular cameras (see *Video Storage, Recording, and Playback*, pp. 42-44), surveillance cameras (p. 206), passive visual sensors (pp. 46-47), and more-specialized equipment. Most of the gear below requires the Electronics Operation (Surveillance) skill.

Endoscopes (TL6)

Experimental endoscopes date to the 1800s. These were inflexible, but gave doctors their first look inside the stomach (the earliest test subject was a sword swallower!). Versions practical for intelligence-gathering appeared in the 1950s.

Sometimes called a "fiberscope" or a "borescope," a modern endoscope consists of optical fibers within a thin (0.1-0.3") steel-mesh tube. Controls at the user's end allow him to flex and bend the far end precisely. The attached eyepiece lets him see what his 'scope is pointed at.

Search Endoscope (TL6). A short 'scope optimized for looking for items concealed within hollow objects or body cavities gives +3 to Search. Used to observe lock tumblers through a hole drilled in a safe or a door, it gives +2 to Lockpicking. $1,500, 2 lbs., 2×S/week. LC4.

Surveillance Endoscope (TL7). This powerful, yard-long model lets the user peer under doors, through holes in walls and floors, around corners and window frames, etc., while staying out of sight. The tiny lens gives -3 to Vision rolls. Spotting the protruding tube requires a Vision-5 roll. $4,500, 2 lbs., 2×S/week. LC4.

Mail-Security Spray (TL6)

This aerosol spray turns envelopes and similar paper packaging transparent on contact, revealing the contents. It evaporates in minutes, leaving no visible trace (a lab test and a Forensics roll *will* detect it). A can good for dozens of uses: $30, 1 lb. LC4.

Wire Rat Gear

Almost every TL7-8 surveillance kit bag or stakeout vehicle includes "generic" transmitters and receivers.

A/V Transceiver (TL7)

This receives signals from (and transmits instructions to) bugs, wireless cameras, A/V transmitters, etc., to which it's tuned. It can receive up to four channels at a time, feeding each signal to a separate jack for viewing, listening, or recording. A small video display is included.

A/V Transceiver (TL7). $100, 6 lbs., 4×S/4 hrs. LC4.
A/V Transceiver (TL8). $100, 3 lbs., 4×S/4 hrs. LC4.

A/V Transmitter (TL7)

This transmitter connects to any electronic audio or visual surveillance device (mike, camera, etc.), turning it into a "bug." Broadcast range is 1/2 mile.

A/V Transmitter (TL7). $500, 4 lbs., 2×S/4 hrs. LC4.
A/V Transmitter (TL8). $500, 1 lb., 2×S/4 hrs. LC4.

Security Document Scanner (TL8)

The size of a desktop photocopier, this device uses infrared or ultraviolet light to examine papers and packages. It can see through ink, erasures, correction fluid, etc., and detect subtle alterations. While intended for document security, it also has surveillance applications: an Electronics Operation (Security or Surveillance) roll at -2 lets the operator produce a legible copy of a document in a sealed envelope. $500, 40 lbs., external power. LC3.

Video Bugs (TL8)

The term "bug" was formerly reserved for microphones, but microchip-sized pinhole cameras add video bugs to the surveillance expert's bag of tricks.

Miniature Video Bug (TL8). This state-of-the-art device – about the size of a 9mm cartridge (SM -11) – contains a color camera, a transmitter, and a power supply. It provides a crisp video image up to two miles away. $1,000, neg., T/week. LC3.

Dirty Tech: Homemade Surveillance Gear

Regardless of its Legality Class, surveillance gear is difficult to acquire "no strings attached." Even in low-Control Rating areas, simply buying a bug or a wiretap from a novelty "spy shop" can attract unwanted attention. A credit card leaves a paper trail – and while you can always pay cash, anyone who sells security cameras will almost certainly have video of *you* making the purchase!

Luckily, such equipment isn't difficult to build. The parts are common enough that purchasing them attracts little attention, and you might even be able to scavenge what you need from electronics purchased at a garage sale or dug out of the trash – a great use for Scrounging! Most audio and video bugs require about half a day's work, $10 to $20 in materials, and an Electronics Repair (Surveillance) roll. Tiny projects are hard to pull off with a soldering gun, though. For any device smaller than a matchbox (SM -9), apply SM+9 as a penalty to skill; e.g., a 1/2" audio bug (SM -13) gives -4.

Subminiature Video Bug (TL8). The smallest video bugs are the size of a multivitamin capsule (SM -13); in fact, they're used to diagnose intestinal problems when an endoscope would be too invasive. Transmitter range is less than 500 yards. The special internal battery lasts for 48 hours. $1,500, neg. LC3.

Video Bug (TL8). An over-the-counter "spy shop" video bug is still a capable surveillance device. About the size of matchbox (SM -9), it can transmit a high-quality video signal up to two miles away. $250, neg., T/week. LC4.

Tracking Devices (TL7)

Tracking devices range from the benign – like the personal rescue beacon (p. 59) – to the more sinister "tracking bugs" used for surveillance. All communicate via radio and are subject to that medium's inherent limitations (see *Radio,* pp. 37-40).

Radio Beacon (TL7)

This is the classic Hollywood "tracking beacon" – a radio transmitter designed to be attached to a vehicle, hidden in a briefcase, etc. Its signal is detected using a radio direction finder (pp. 38-39). Anyone scanning for bugs has +4 to find this "noisy" device. Each tracker has a special coded signal that allows those who planted it to recognize it easily. Range is 25 miles.

Radio Beacon (TL7). $300, 0.5 lb., S/month. LC4.
Radio Beacon (TL8). $300, 0.25 lb., XS/month. LC4.

Cell Phone (TL8)

Cell phones (p. 39) broadcast a constant identification signal while turned on, even when not making calls. This is how the cellular network "knows" where to route incoming calls. Those with access to the network – e.g., government agents with a subpoena – can fix a cell phone's location to within half a dozen blocks in an urban area or a few miles in a rural setting.

Cellular Locator Beacons (TL8)

A cellular locator beacon is a GPS receiver (p. 53) that communicates its current position – accurate to within a few feet – over a cellular telephone network. A service ($50/month) is available that lets anyone with an Internet connection and the correct password track the beacon in real time. The locator may be set to transmit a record of its position history at regular intervals and then switch off its transmitter. While this prevents tracking in real time, it saves power and reduces the chance of detection. Multiply battery life by 10 for hourly updates, 100 for daily updates.

Cellular Beacon (TL8). This device can run off its onboard battery pack or be connected to a vehicle's power supply for indefinite operation. It must be in reach of a cellular network to relay its position, and is susceptible to jamming. *Triple* cost for a version that uses satellite phone (pp. 39-40) technology, which can be tracked anywhere in the world. $1,500, 1 lb., S/week. LC4.

Personal Cellular Beacon (TL8). This is a smaller unit built into a wristwatch, bracelet, shackle, etc. $400, 0.1 lb., T/month. LC4.

Encryption

Encryption is a body of techniques for concealing a message's meaning from anyone but the intended recipients. It's crucial at TL6-8 owing to the prevalence of easily intercepted telecomm technologies. The wars of the first half of the 20th century drove this point home, with encryption (and its defeat) influencing several prominent successes and failures.

Encryption takes two basic forms:

- A *code* is a series of prearranged secret meanings; e.g., "One of by land, two if by sea."
- A *cipher* is a method of transforming data – whether via a simple substitution (e.g., Morse code) or a mathematical algorithm. The strongest ciphers disguise the signal as seemingly random gibberish. A recipient who has the key can "decrypt" the message and extract its information.

Code-Breaking (TL5)

In 1929, Henry L. Stimson – U.S. Secretary of State at the time – quipped, "Gentlemen do not read each other's mail," and closed the U.S. State Department's cryptographic unit (the Black Chamber). Meanwhile, unbeknownst to Stimson, the U.S. Navy and Army were intercepting Japanese traffic. Overseas, Britain and Poland were working like mad to defeat the Enigma machine (see *Cipher Machine,* p. 211).

To break a simple, ad-libbed code or cipher, *win* a Quick Contest of IQ-5 with its creator. Either party may substitute the Cryptography skill (p. B186). Beating the systems under *Encryption Devices* (p. 211) and *Encryption Standards* (p. 211) *requires* Cryptography, however.

At TL5-6, use the rules on p. B186 to crack encryption. This is usually a group effort. Each team member with Cryptography at 17+ adds +1 to the leader's skill (maximum +4).

At TL7-8, breaking mathematical ciphers involves running specialized software on a computer. *Ignore* the time requirements and skill modifiers on p. B186, which are for manually devised codes. Instead, start with the base time under *Encryption Standards,* apply *Time Spent* (p. B346) modifiers for extra time, and add software bonuses as follows:

Basic Code-Breaking Program (TL7). Basic equipment for breaking TL7 ciphers. Complexity 3. $10,000. LC2.

Basic Code-Breaking Program (TL8). Basic equipment for breaking TL8 ciphers. Complexity 3. $1,000. LC3.

Good Code-Breaking Program (TL8). +1 to Cryptography. Complexity 5. $10,000. LC2.

Fine Code-Breaking Program (TL8). +2 to Cryptography. Complexity 7. $100,000. LC2.

Encryption Devices (TL5)

The earliest encryption device might have been the Spartan "skytale": a leather strip wrapped around a staff of a particular diameter. The message was written on the strip down the length of the staff (*not* following the strip). The strip alone was sent to the recipient, who wrapped it around an identical staff to read the message.

Cipher Wheel (TL5)

Thomas Jefferson devised the cipher wheel while serving as minister to France; similar encryption devices were used during the American Civil War and WWI. It consists of several wooden or brass wheels, with the alphabet randomly inscribed along the edge of each, threaded onto a spindle. The operator rotates the wheels until his message appears on one row, and then moves down a row and copies the "nonsense" letters. To decrypt, the recipient lines up the seemingly random letters and moves up a row to read the message.

A cipher wheel lets its user encrypt a message with its creator's Cryptography skill, typically 16-18. Enciphering or deciphering takes two minutes per line. $100, 1 lb. LC2.

Cipher Machine (TL6)

Hundreds of cipher machines were in use in the 1910s and 1920s. The famous Enigma, first offered for sale at a postal workers' conference in 1923, was just one of many – although a highly successful example. With modifications, it became Germany's standard encryption machine throughout WWII.

Cipher machines resemble Jefferson's cipher wheel mated to a keyboard, albeit with many refinements. Their alphanumeric rotors move in a cog-like fashion with each keypress, mixing and matching letters and numbers to generate millions upon millions of ciphered alphabets. Such devices grant basic encryption (see right) *without* digital computer technology. $20,000, 20 lbs. LC2.

Encryption Unit (TL8)

This external adapter contains an encryption chip, a keypad, etc. It snaps onto a communicator or connects to it via cable. Different models exist for fax, computer modem, radio, cell phone, etc. See *Encryption Standards* (below) for effects.

Basic Encryption Unit (TL8). $100, 0.25 lb., XS/6 hrs. LC4.

Secure Encryption Unit (TL8). $500, 0.25 lb., XS/6 hrs. LC2.

Encryption Standards (TL6)

Encryption systems that use complex mechanisms or mathematical keys are rated for the Complexity of computer needed to crack them.

Basic Encryption (TL6)

This is defined as the encryption standard that – *at its TL* – is strong enough to be reasonably secure but not so complex that it slows operations.

Basic Encryption (TL6). Calls for a $20,000 cipher machine (see above), and only enciphers text. Attempts to crack it require both manual efforts *and* specialized electromechanical or vacuum-tube hardware. Base time is 10 years for apparatus equal to a Complexity 1 computer in cost and weight, or a year for tools equivalent to a Complexity 2 computer. LC4.

Basic Encryption (TL7). A permanent modification to any telecomm hardware. Defeating it requires at least a week and a Complexity 3 computer running code-breaking software (pp. 210-211). $1,000. LC4.

Basic Encryption (TL8). A *free* modification for most telecomm gear. Beating it requires at least a day and a Complexity 5 computer with suitable software. LC4.

Secure Encryption (TL7)

This system is typical of those used to secure classified government or military information. There may be a delay of 1-2 minutes at TL7, or 1-2 seconds at TL8, as messages are sent or data is processed. Cracking it is effectively impossible before TL9. Practical approaches are suborning a key-holder or discovering a weakness in the system's mathematical basis.

Secure Encryption (TL7). A piece of software, usually on a computer dedicated to the purpose. Complexity 2. $5,000. LC2.

Secure Encryption (TL8). A built-in microchip for any telecomm device. If connected externally, see *Encryption Unit* (above). $500. LC2.

Countersurveillance

Countersurveillance technology aims to maintain the privacy of people, places, and activities. At TL6-8, it encompasses *electronic countermeasures* (ECM): tools to detect and defeat electronic surveillance (pp. 210-211) and unauthorized transmissions. Governments are the field's major players, but most Fortune 500 companies keep a countersurveillance team on retainer and routinely sweep sensitive areas for bugs. Thus, this is also a lucrative civilian business.

For other ways to keep secrets, see *Encryption* (pp. 210-211) and *Disguise and Smuggling* (pp. 214-215).

Privacy Technology (TL5)

Privacy is ultimately a matter of personal and communications discipline, but hardware can lend a hand.

Invisible Ink (TL5)

Invisible ink is an *old* trick. Lemon juice, onion juice, and many other kitchen recipes produce perfectly good secret ink that becomes visible when heated. Modern versions are only visible under UV light.

Using invisible ink in a pen requires finesse: too much pressure makes visible indentations, while too little pressure results in writing that's *permanently* invisible. The GM should make a DX roll in secret for anyone using improvised equipment or writing a long message. Failure means the recipient can't read the note. Critical failure means the letter is readable with a simple Vision roll – but the *writer* doesn't notice!

In the age of typewriters, agents used sheets of what they called "carbon." This works like mundane carbon paper but produces a copy in invisible ink. Modern spies can fill standard computer printer cartridges with secret ink.

A bottle of invisible ink or a few sheets of "carbon" is $10, neg. An invisible-ink printer cartridge is $150, neg. LC4.

Special Writing Papers (TL5)

Spies who must dispose of sensitive written messages quickly often make use of specially treated paper. Some varieties turn to ashes in a puff of low-temperature flame almost as soon as lit. *Thin* paper can be made edible or especially susceptible to water; in either case, water turns the paper into unrecognizable goop in seconds. $1 for 10 sheets. LC4.

Bug Detector (TL7)

This portable device detects and locates radio transmitters and microphones. Countersurveillance agents who find a bug may case it, waiting for an inside man to change the battery. Alternatively, they might announce a sensitive meeting in advance and then watch the area as surveillance crews arrive to monitor the event.

To locate a bug, the detector's operator must *win* a Quick Contest of Electronics Operation (Surveillance) with the person who hid the bug. This involves sweeping the room with a 2' handheld antenna, and takes about a minute per 100 square feet scanned. Good- or fine-quality gear costs 5× or 20× as much and gives +1 or +2 to skill, as usual, but is briefcase-sized or larger. $500, 1 lb., 2×S/week. LC4.

Shielded Room (TL7)

A room lined with metallic mesh will defeat transmitters. Windows may employ shielded glass to provide similar protection, use special glazing to foil laser mikes, and have blinds or mirroring to counter visual observation. Soundproofing thwarts audio surveillance – including ears at the door. Filtered telecomm jacks and electrical outlets defend against bugs and wiretaps.

Such features are invisible to the naked eye and collectively give *at least* -5 to electronic intelligence-gathering attempts made on the shielded area. At the GM's option, some technologies may fail automatically. Per square foot of wall, ceiling, and floor area: $50. LC4.

Voice Modulator (TL7)

This gadget alters the user's voice to be difficult or impossible to identify. It snaps onto most phones, cell phones, and radios, and has jacks for recording equipment. At TL7, it turns the speaker's voice into an anonymous, mechanical monotone. At TL8, it can obscure his voiceprint but leave him sounding human: a male voice can sound female, an adult's voice like a child's, and so on. $350, 1 lb., 3×S/week. LC4.

Electronic Signals Jamming (TL6)

A *jammer* neutralizes communications and surveillance devices by emitting a signal that compromises the target systems' ability to gather intelligence and/or transmit and receive.

Radio Jammers (TL6)

A radio jammer emits a barrage of broad-spectrum radio-frequency "noise" that hinders radio communications (cell phones, tactical radio, etc.), wireless bugs and tracking devices, and radio-controlled hardware (notably remote blasting machines and remotely piloted vehicles). Its presence but *not* its location is obvious as soon as it's switched on. Police and soldiers use such devices against radio-detonated bombs. Cinematic spies employ them to prevent guards from summoning help by radio.

Anyone who wishes to operate radio gear within range of a jammer must *win* a Quick Contest: his skill with the Electronics Operation specialty for his hardware vs. the Electronics Operation (EW) skill of the jammer's operator.

"Jamming" Cameras

Smoke can blind a camera and a disguise can fool it, but people near the camera will notice these things. A radio jammer (see above) works against *wireless* cameras – but these are uncommon. A subtle way to blind almost any camera is to mount a targeting laser (pp. 156-157) on a tripod (see *Video Accessories*, p. 43) and, with the aid of a telescopic sight (pp. 155-156), point it directly into the camera's aperture. Of course, the *infiltrator* won't know if it's working!

At up to 10× the jammer's range, he must make an unopposed Electronics Operation roll to use his equipment, even if no roll is normally required.

Area Jammer (TL6). This large jamming station fits in a cargo truck or a van. It requires an operator. Range is 1/2 mile. $5,000, 100 lbs., external power. LC2.

Area Jammer (TL7). Range is a mile. $5,000, 50 lbs., external power. LC2.

Area Jammer (TL8). Range is two miles. $5,000, 25 lbs., external power. LC2.

Expendable Radio Jammer (TL8). This device *doesn't* require an operator. When switched on, it hops between common frequencies hundreds of times a second. Its effec-

tive Electronics Operation (EW) skill is 18. Range is 50 yards. $500, 5 lbs., M/2 hrs. LC2.

White Noise Generator (TL7)

This device creates "white noise" that defeats laser mikes, audio bugs, tape recorders, etc. It includes a generator and four speakers.

White Noise Generator (TL7). $150, 4 lbs., 3×S/4 hrs. LC4.

White Noise Generator (TL8). $150, 2 lbs., 3×S/4 hrs. LC4.

Cell-Phone Jammer (TL8)

This jamming system specifically blocks all cell-phone calls within 15 yards. A system with a 30-yard range has double cost and weight. $500, 5 lbs., external power. LC2.

Deception and Intrusion

The most important items in an adventurer's tool kit are sometimes those that let him get into places he shouldn't, grab items or information he isn't supposed to have, and then escape undetected. Commandos, spies, and thieves who face the technologies described in *Security and Surveillance* (pp. 202-213) often deploy gadgetry of their own.

Burglary

Intruders will try to crack even the best security. With the right gear, they might just succeed!

"Burglar's tools" consist principally of hardware with legitimate applications. *Hand Tools* (pp. 24-26), *Power Tools* (pp. 26-27), *Rescue Tools* (pp. 29-30), and *Conventional Explosives* (pp. 183-187) describe many handy items. An endoscope (p. 209) gives +2 on rolls to crack locks, safes, and anything else where *seeing* the normally hidden insides would be useful. A stethoscope (pp. 213, 222) is basic equipment for safecracking and – in a very quiet environment – good for +2 on rolls to defeat security devices where *hearing* the mechanism would help (including mechanical locks).

The gadgets below have fewer lawful uses . . .

Lockpicks (TL5)

Basic equipment for the Lockpicking skill includes a set of *picks* in dozens of different lengths and shapes, *rakes* for quickly defeating basic locks, and *tension wrenches* that provide the leverage to open the lock. Such hardware varies greatly in quality. The best picks are made of hardened steel, titanium, etc., and shaped by factory-trained locksmiths specifically to open certain types of locks. In a pinch, a couple of paperclips or hair clips will do. Use *Equipment Modifiers* (p. B345) for improvised and high-quality tools. A complete set of nigh-universal lockpicks in a wallet-sized package: $50, neg. LC3.

Electronic Lockpicking Kit (TL7)

At higher TLs, lockpicking gear resembles an electrician's tool kit, with various electrical components, testers, bypasses, and bridging devices, plus cutting and drilling tools for gaining access to a security system's innards. This kit is basic equipment for using Electronics Operation (Security) to circumvent electronic locks. $1,500, 3 lbs., 3×S/week. LC3.

Lockpick Gun (TL7)

A lockpick gun resembles a plastic toy gun with a squeeze handle. It grants +4 to Lockpicking against *basic* locks, for a total of +9! It gives an extra -5 to skill vs. *good* or *fine* locks, though, as its clumsy mechanism is too large to engage the lock or its methods are too simple to be effective. Each attempt takes five seconds. $50, 1 lb. LC3.

Electronic Stethoscope (TL8)

This is a sensitive contact mike (p. 208) attached to a digital amplifier, with headphones. It can detect human activity underground or behind massive walls; assume that it can hear sounds through three yards of loose stone or a yard of solid material. It gives +1 to Explosives (EOD) rolls to detect or defuse mechanical bombs, and can function as a regular stethoscope. $300, 0.4 lb., 4×T/week. LC4.

Forgery and Counterfeiting

Forgers make illicit copies of documents, while counterfeiters produce illegal currency. Criminals and honest heroes alike might need to pass fake IDs or bogus cash during an adventure. Spies often use forged papers. *Nations* have been known to engage in large-scale counterfeiting in an effort to destabilize enemy economies; in WWII, both sides did this.

Making fakes may require unusual inks, paper, etc., as well as the tools below. No price is given for such materials. Obtaining them is often its own covert op!

Counterfeiting Tools (TL5)

At TL5, a counterfeiter's work is comparatively easy. Coins and paper money are handmade, or use hand-engraved printing plates; minor variations are common, even expected. It has been estimated that as much as *two-thirds* of the currency in England was counterfeit during the 1700s. This was largely the work of Irish and English silversmiths, who also did a brisk trade in copying and selling American bills – and the plates to print them – to criminal elements in the Thirteen Colonies. Boston papers often reported counterfeiting operations seized aboard ships in the harbor.

Mule Pills

At TL8, the preferred method for carrying drugs across heavily enforced borders is to have the courier – sometimes called a "mule" – swallow a "mule pill." This is a packet constructed from the finger of a surgical glove sealed with paraffin. Each thumb-sized "pill" holds about half an ounce. Mules practice by swallowing grapes, eventually working up to 50, 100, or even 150 packets. After completing a run, the mule takes a laxative and passes the pellets over several hours. Nothing prevents smugglers from carrying cargoes other than drugs; indeed, counterterrorism experts fear that explosives could be carried onboard a plane this way.

A mule must make a HT roll at -1 per 50 pellets swallowed. Success means the ruse works and the mule survives the ordeal. Failure results in an incident, such as passing pills too quickly or throwing some of them up. On a critical failure, a packet *bursts,* exposing the mule to its contents – often a lethal dose of cocaine or heroin.

The pressure of the pills in the stomach causes cramps or more intense pain (see *Afflictions,* p. B428). The mule's sweating and discomfort can tip off observers. To spot this, a screener must *win* a Quick Contest of Search or Observation against the mule's Acting skill. An X-ray machine (pp. 217, 222-223) is more reliable: a successful Electronics Operation (Medical or Security) roll allows a Search attempt to detect the pellets in the mule's digestive tract.

A mule pill is $0.1, neg.

At TL6-8, high-volume printers and automatic coining machines let nations eliminate unintended variations; people are therefore more likely to spot imperfect fakes. At TL8, a surprising volume of counterfeit money is printed on desktop computer printers (p. 21). The technology to track counterfeiting is equally advanced: many printer manufacturers use tiny dots, invisible to the naked eye, to mark each printed page with a serial number that can be tracked to the printer. Roll against Counterfeiting to avoid buying a model that does this!

Basic counterfeiting tools that allow the production of a few bills or coins per hour are $1,200, 20 lbs. LC4.

Fake Credit Cards (TL8)

At TL8, counterfeiting includes reproducing and modifying credit cards. This requires a computer running a credit card-number generator program (Complexity 1, but LC3 or less, and not for sale), plus some special equipment:

Card Printer (TL8). Required to *create* cards. $5,000, 30 lbs., external power. LC4.

Magnetic Strip Decoder/Encoder (TL8). Needed to modify *or* create cards. $600, 4 lbs., external power. LC4.

Forgery Tools (TL5)

Frank W. Abagnale went to prison in 1969 at 21 years of age, having "kited" over $2.5 million of forged Pan Am checks. He had traveled the world as an airline pilot, posed as a doctor, and acted as the assistant to an attorney general. His tools included boyish good looks, a photographic memory, and the ability to pass forgeries with ease. His most complicated piece of equipment was the decal from a model airplane kit.

Checks are easier to fake than ID, however. There are *two* steps to establishing false identity: duplicating the card, badge, or document, and ensuring that official records show the fake as valid. No matter how realistic the ID looks, it's worthless if a two-second computer check shows that the owner doesn't exist or died 20 years ago!

At TL5, forgery is mainly about replicating handwriting. All that's needed is stationery. See *Office Technology* (pp. 18-19).

At TL6, forgers must keep pace with photo-ID cards and high-tech bureaucracy, and need cameras, rubberstamps, and embossers. Basic forgery tools are $1,200, 20 lbs. LC4.

At TL7-8, forgers need a computer with a printer (see *Computers,* pp. 19-22) as well as basic tools. Counter-forgery technology grows even more sophisticated. To fake things like hologram-stamped ID cards, it might be easier to break into the issuer's office and use – or steal – their equipment.

Disguise and Smuggling

Getting people and goods past those who are looking for them is *hard* without specialized equipment. A cunning deception helps, too. When the U.S. embassy in Tehran was overrun in 1979, six Americans managed to escape the initial onslaught and reach the Canadian embassy. Deteriorating conditions in Iran meant that the Canadians couldn't guarantee the embassy staffers' safety, so the U.S. government turned to the CIA to "exfiltrate" them. The CIA procured forged Canadian passports for the staff, opened a fictitious film company as cover, and whisked the six out of the country disguised as a flashy Hollywood production crew.

Disguise Kits (TL5)

Disguise has a long and storied past in espionage. During the American Civil War, Allan Pinkerton's Union agents disguised themselves as peddlers, trading buttons and thread among unsuspecting Confederate soldiers while collecting rumors and valuable intelligence. More recently, the CIA's Office of Technical Services tapped John Chambers, the famed special-effects artist responsible for the costumes in the *Planet of the Apes* films. Chambers and his technicians taught the CIA how to prepare what agents call "advanced disguise": silicone facemasks complete with hair.

A disguise may require the Disguise and/or Acting skills, depending on the user's intentions. It might be as simple as a stolen uniform or as elaborate as full-body makeup. A few items easily concealed on the body, such as a wig and a fake heel that alters gait, allow a Disguise roll at -5 for improvised equipment. More advanced equipment is possible.

Basic Disguise Kit (TL5)

This attaché case contains makeup, false teeth, wigs and hairpieces, etc. $200, 10 lbs. LC4.

Advanced Disguise Kit (TL7)

This gear allows elaborate disguises involving custom-made noses and ears, complete facemasks, etc. It gives +2 to Disguise, but the user needs at least a day to prepare a new disguise, which requires two to six hours for fitting each time it's worn. $4,000, 250 lbs. LC4.

Smuggler's Luggage (TL5)

Smuggling is the art of sneaking objects or even *people* across borders and through checkpoints. There are many motivations for this, including profit, crime, and national interests. Luggage with a hidden compartment or a false bottom can help. The items below have a secret area that holds 1/10 the listed capacity, giving +2 (quality) to Smuggling.

Steamer Trunk (TL5). Holds 400 lbs. or 5 cubic feet. $4,000, 40 lbs. LC3.

Travel Bag (TL5). Holds 100 lbs. or 5 cubic feet. $1,200, 10 lbs. LC3.

Attaché Case (TL6). Holds 20 lbs. or 2 cubic feet. $400, 2 lbs. LC3.

Computer Intrusion

Secure computers sit in high-security rooms and *aren't* networked. "Hacking" them requires physical access – use Fast-Talk and a forged ID, burglary, etc. Less-secure machines on networks *might* succumb to a quick run down a list of known vulnerabilities or a painstaking search for new ones; either way, basic equipment is a computer, a network connection, and coffee. The most effective route into many systems is to suborn an authorized user . . . or use special tools to spy on him.

Computer Monitoring Gear (TL7)

This apparatus intercepts and decodes the incidental radio-frequency emissions of electronic devices – including computers. The operator can read the contents of video displays (computer monitors, ATM screens, medical equipment, etc.) and capture the telltale signature of electronic typewriters, printers, fax machines, and so on. This requires an Electronics Operation (EW) roll, at a -1 per 100 yards past 300 yards. Maximum range is 1,000 yards (-7), but electrical "noise" and tall buildings limit range to 100 yards in many urban areas. There's an extra -3 to find a specific machine among many.

Computer Monitoring Gear (TL7). Hardware the size of a refrigerator, normally mounted in a van. $50,000, 300 lbs., external power. LC3.

Computer Monitoring Gear (TL8). A laptop computer running Complexity 3 software and a database, plus a small electronics box and an antenna. $5,000, 6 lbs., external power. LC3.

Keyboard Bug (TL7)

The keyboard of a computer, data-entry terminal, electric typewriter, etc., can be modified to intercept anything typed on it – passwords being the most valuable target. Keyboard bugs transmit by radio, by phone, or (especially on a computer) over the Internet. Installation requires tools, few minutes' access to the keyboard, and an Electronics Operation (Surveillance) roll.

At TL8, such hardware is sold commercially as either a pass-through device plugged into the keyboard cable or a complete keyboard with onboard memory. Software can do the same thing, recording every keystroke and mouse movement. This may be installed as a virus or even as an openly documented feature; e.g., to allow companies to monitor use of their equipment. $100, neg. LC4.

Enforcement and Coercion

Lawmen sometimes supplement technique with technology in their quest to solve crimes and protect citizens from sociopaths and terrorists. Of course, many of their tools can be put to sinister uses – notably torture and illegal surveillance.

Lie Detection

Investigators employ a combination of methods to determine whether a suspect, witness, or victim is telling the truth. Initially, they speak casually with the subject, perhaps under the guise of clarifying a report; this is an application of Detect Lies (p. B187). If they want to probe further, they call in the contact for an interview, which often includes carefully choreographed and rehearsed actions in an environment designed to compel the interviewee to tell the truth – a use of Interrogation (p. B202). "Lie detectors" are typically the last resort.

Polygraph (TL6)

In 1908, Dr. James Mackenzie, a London cardiologist, invented the *polygraph* – so named because it monitored multiple physiological processes and graphed them. Polygraphs developed since the 1930s track heart rate, respiration, blood pressure, and skin conductivity, and display the values on a paper graph or (at TL8) a digital display. These readings indicate the subject's degree of relaxation. In theory, since the act of lying causes tension, this means the machine can help spot a deception. The *device* doesn't decide that a lie has been told, though; the *operator* does this, by carefully interpreting the data.

Psychologists have debated the polygraph's accuracy since its invention. The premise that lying causes stress might not be true. In many circumstances, speaking the truth causes more discomfort than telling a lie. Certain pathological liars have no compunctions about spouting falsehoods. Furthermore, people have devised many methods for throwing off a lie detector's calibration, ranging from relaxation techniques to stepping on a tack hidden in the shoe. The value of such tricks is itself debatable.

This controversy is also visible in practice. Some institutions, including British military intelligence and most courts of law, place no value on polygraph results. Others – notably, nearly all Federal agencies in the U.S. – routinely use polygraphs in security checks.

If the GM decides that these devices work as advertised, then a polygraph gives a modifier to Interrogation. Roll a Quick Contest between the operator's Electronics Operation (Medical) skill and the subject's Will. The interrogators get a bonus or a penalty to Interrogation equal to their margin of victory or loss. The polygraph operator and questioner need not be the same person; a technician with Electronics Operation and an interviewer with Interrogation can work as a team. The GM should make *all* of these rolls in secret.

People with the Compulsive Lying disadvantage always appear to be telling the truth on polygraph tests. The interrogators *automatically* have -5 on machine-aided Interrogation rolls! For appearance's sake, though, the GM should make all the usual rolls.

If the interrogators wish, they may make two Interrogation rolls per question: one with the polygraph's aid and one without. They have only their intuition (and possibly Intuition) with which to choose the more accurate result, however.

Polygraph (TL6). A suitcase-sized device with rubber tubing for the arm and chest, and coils of wire leading to a skullcap. $8,000, 25 lbs., external power. LC4.

Polygraph (TL8). A small box plugged into a laptop running Complexity 3 software. The subject wears a clip on his finger, a blood-pressure cuff on his arm, and a band across his midriff. $1,500, 1 lb., S/8 hrs. LC4.

Voice Stress Analyzers (TL8)

The U.S. Army began researching the possibility of *remote* lie detectors in the 1960s. In 1970, three retired Army officers formed Dektor Counterintelligence and Security and marketed a new lie-detection system called the Psychological Stress Evaluator. This "voice stress analyzer" (VSA) could supposedly detect a liar by the "microtremors" in his voice. In 1988, a software-based computerized voice stress analyzer (CVSA) came on the market.

With a VSA, nothing is attached to the subject's body. It can be used without his knowledge and even applied to a high-quality recording. Its effectiveness and scientific validity are hotly contested, however – especially by proponents of the polygraph. For game purposes, treat a VSA as a polygraph that has half the usual effect on Interrogation.

VSA (TL7). A briefcase unit with a cassette tape recorder and a tape-strip analyzer. $25,000, 15 lbs., external power. LC4.

CVSA Software (TL8). Professional software that typically runs on a laptop. Requires a microphone (p. 41) and/or a tape recorder (p. 41). Complexity 4. $5,000. LC4.

Forensics

Forensic equipment analyzes crime-scene clues – a subject covered in detail in ***GURPS Mysteries.*** Two extremely widespread items appear below.

Fingerprint Kit (TL6)

The friction ridges on the hands and feet are unique to each person and remain consistent throughout life. The prints these leave – especially fingerprints – are therefore a useful means of identification. Prints are called *patent* if made in ink, blood, etc., or *latent* if created by sweat or body oils.

Various chemicals and powders are useful for revealing latent prints. Prints can be recovered ("lifted"), with varying degrees of success, from many surfaces – including human

skin. Recovery *isn't* possible from rough materials like brick, unpolished stone, unfinished wood, and cloth.

At TL7-8, a computerized database can compare recovered prints to those on record relatively quickly. This may still take hours or days. Note that the computer merely selects likely candidates for a human expert to study – it doesn't provide a definitive match.

A pocket-sized fingerprint kit is a case containing a small amount of powder, two brushes, several transparent "lifters," and a pad of ink. A Scrounging roll might turn up powders and cellophane tape that qualify as improvised equipment. $50, 1 lb. LC4.

Evidence Collection Kit (TL7)

A case containing a tape measure, a magnifying glass, evidence bags and tubes, markers, gloves, syringes for collecting liquid specimens, scissors, tweezers, and a penlight. $150, 10 lbs. LC4.

Restraints

Police officers use a variety of restraints in order to lower the level of force necessary to subdue a prisoner. These reduce the threat of assault by the captive, protect him from harming himself, and make him an easier target.

Handcuffs (TL5)

Early handcuffs were *shackles* – a one-size-fits-all affair. Ratcheting cuffs were invented in the 1860s. These made it possible to adjust the fit, providing a tighter and more secure hold on the wrists.

Someone with his hands cuffed behind his back can't perform tasks that require free use of the arms and has -1 to DX in general. He can attempt things that require only the hands, but at *-4* to DX – and he must work blind if trying to manipulate something behind his back. A successful Acrobatics or Escape roll lets the prisoner bring his legs up and slip his arms around to the front.

Someone who has his hands cuffed in front of his body suffers no general DX penalty and a mere -1 on tasks that use only the hands. Activities that require free use of the arms (including most one-handed strikes) are still impossible, but two-handed strikes and weapons wielded with the hands close together – pistols, two-handed swords, etc. – incur no penalty. Other weapon use is at -1 to -4 to skill.

Shackles (TL5). Crudely fitted metal wrist restraints. Make an unmodified Escape roll to get free. DR 4, HP 10. $50, 2 lbs. LC4.

Handcuffs (TL6). Metal, key-locking cuffs give -5 to Escape. DR 4, HP 6. $50, 0.5 lb. LC4.

Flex Cuffs (TL7). Flexible plastic loops give -1 to Escape. DR 1, HP 2. Pack of 10: $5, 0.25 lb. LC4.

Leg Irons (TL5)

Law officers often put criminals in leg irons when transporting them. Someone in leg irons suffers effects identical to Crippled Legs (p. B141). Activities that require free use of the legs (e.g., kicking) are impossible. Getting free requires an Escape roll against non-ratcheting leg irons (TL5), an Escape roll at -5 for ratcheting models (TL6-8). *Triple* cost to add a 50-lb. iron ball on a 6' chain; the prisoner must carry the ball, which is a hefty bit of extra encumbrance! DR 4, HP 10. $40, 2 lbs. LC4.

Straitjacket (TL5)

The *straitjacket* (or *strait waistcoat*) was first used in England in the 1700s for restraining violent prisoners and mental patients – known then as "lunatics." By the 1950s, most institutions had eliminated it. More recent models are generally props or novelties.

A straitjacket is a heavy canvas or leather coat with long sleeves that are wrapped around the body and buckled or tied behind the back. Someone restrained this way is in the same predicament as if he were handcuffed behind his back (see *Handcuffs,* see left), with two additional restrictions. First, he cannot use his hands; they're encased in the sleeves. Second, because the sleeves are buckled tightly against the body, there's no possibility of slipping the arms around to the front.

Ease of escape from a straitjacket depends greatly on the competence of those who strapped it on; magicians and escape artists use an *oversized* model, applied by a novice. On average, Escape rolls are at -10. $100, 3 lbs. LC4.

Bomb Disposal

The work of explosive ordnance disposal (EOD) technicians, oft-romanticized in fiction, could form the basis of an exciting campaign. Beyond a flashlight (p. 52) and an EOD tool kit (costs and weighs as much as an Armoury kit; see *Tool Kits,* p. 24), two other items are important.

Dearmer/Disruptor (TL8)

This is a tube-shaped device mounted on a tripod. The EOD technician uses a laser beam to aim it at the bomb or bomb component he wants to destroy. He then triggers it remotely, via a long cable, to fire a 12-gauge frangible slug (p. 167). On a successful Explosives (EOD) roll, this neutralizes the target. Critical failure causes the bomb to explode! $200, 1 lb. LC3.

Portable X-Ray Machine (TL8)

This machine uses X-rays to see *inside* objects, and is designed for inspecting suspicious packages and helping EOD teams defuse bombs. It includes an X-ray source (which resembles a video camera) and an X-ray receiving unit. Receiver and source go on either side of the item being inspected, directly opposite one another. Via a 150' cable or a wireless connection, the laptop control unit can display the X-ray video image from the receiver, allowing the operator to look at the target's internal components in real time. This gives +4 to Explosives (EOD) when defusing a bomb and +5 to Search when examining a package or vehicle's contents. The system comes with its own backpack, and has rechargeable batteries that last for three hours. $50,000, 25 lbs. LC3.

Chapter Seven

Medical and Health Technology

Airk grunted as Nat extracted yet another pellet from his shoulder. Nat dropped the lead shot into a tin cup.

Locke, holding the flashlight, gave a low whistle. "That's number five. Duck next time."

"I did," Airk said through clenched teeth, as Nat pulled a sixth pellet loose.

Nat plunked the little bullet into the cup and smiled. "That's the last one."

Locke shook his head. "No, you tried to duck." He thumped the IV line to make sure the saline was flowing and glanced at the digital readout from the blood-pressure cuff. "There's a distinct difference between ducking and trying to duck, young Airk."

As Nat began his suturing, Locke administered a tetanus shot, morphine, and an antibiotic. Airk started to argue, but the morphine was carrying him away in peaceful slumber . . .

At TL5-8, technology offers increasingly dangerous manmade threats – guns, mines, fiery collisions, etc. – while opening the door to the world's last frontiers, with *their* hazards and plagues. High-tech heroes can get hurt in all the old ways and dozens of new ones. Thanks to advances in medical gear, though, it's also easier to get better!

The equipment in this chapter comes with many *optional* rules intended to add flavor to a scenario or even an entire campaign with a medical theme. The GM is welcome to use these when he feels they would be dramatic and ignore them when they seem burdensome. Those seeking extensive detail on medical procedures and biotechnology should see ***GURPS Bio-Tech.***

Overview: Medical Tech Levels 5-8

This is an expansion of the list under *Biotechnology/ Medicine* (p. B512).

TL5 – Medicine is still fairly primitive; try not to get sick or hurt! There's no dependable treatment for contagion or infection. Surgery is limited to amputation, bone-setting, trepanning, removing missiles from limbs, and cauterizing wounds (pressing a red-hot iron to severed blood vessels to stop bleeding). Antisepsis and anesthesia appear very late on. Opium is known, but only as a painkiller. Most available "medicines" are ineffective; some are poisonous.

TL6 – More changes in medical technology take place at TL6 than during all previous TLs. Antisepsis and anesthesia are in wide use. The simple act of washing hands and sterilizing instruments before surgery means that most people who go into the hospital come back out. Late in TL6, sulfa offers the first actual cure for bacterial infection.

TL7 – Medicine advances so rapidly that most doctors can keep up only in one specialized field. As TL7 matures, almost any trauma is treatable if the patient is reached quickly. In developed societies, public hygiene and inoculation end all but a stubborn few epidemic diseases.

TL8 – Organs are regularly transplanted and severed limbs are routinely reattached. There's a better than 95% chance of recovery from trauma, even battlefield injuries, if the patient enters surgery within the hour. Public health is so much improved that a difficult-to-spread disease impacting less than 0.5% of the population is a "terrifying plague."

Emergency Equipment

Almost anything in this chapter *might* be valuable in a medical emergency, but gear for providing the "ABCs of resuscitation" (airway, breathing, and circulation) and treating shock is essential – and highly visible in adventure fiction. Except as noted, this equipment requires a First-Aid or Physician roll to use. Remember that First Aid defaults to Physician at *no* penalty.

Airway

A simple First Aid roll will clear most airway obstructions (see *Resuscitation,* p. B425, and the notes for the choking affliction, p. B428). If a trauma victim is unconscious, it's common procedure to *intubate:* insert a tube down his throat to prevent further airway complications. When this fails, rescuers must bypass the blockage, often by performing a tracheotomy. Left untreated, an obstructed airway is ultimately fatal; see *Suffocation* (p. B436).

Tracheotomy Kit (TL5)

This one-use kit consists of a large-bore needle that's inserted into the windpipe – and, at TL6-8, a tube to which a bag mask or oxygen supply can be attached. The kit isn't *required* to perform a tracheotomy, but improvised equipment gives the usual -5 to skill (see p. B345). $150, 0.5 lb. LC4.

Intubation Kit (TL6)

This single-use kit consists of a selection of laryngoscopes, tubing, and other equipment used to extend a breathing tube down a patient's windpipe. $200, 2 lbs. LC4.

Breathing

Once the airway is established, the patient must receive oxygen in order to replenish the depleted blood supply and avoid brain damage and eventual death.

Bag Mask (TL6)

This is a rubber or plastic mask with an attached bulb or bag. It replaces rescue breathing techniques during CPR (p. 220). The rescuer holds the mask in place and pumps the bag by hand to deliver a steady flow of air to the patient. $15, 1 lb. LC4.

Medical Oxygen (TL6)

Oxygen was first used medically in the 1880s, when it was created by heating potassium chlorate and manganese oxide in a glass jar. From late TL6, oxygen is stored in metal cylinders and moisturized to reduce its drying effect on the mucous membranes. Switching from atmospheric air (only 21% oxygen) to pure oxygen is especially useful when treating victims of lung or throat injuries. Use the statistics under *Air Tanks* (p. 74) for oxygen tanks, but multiply the durations listed there by 10 for medical purposes. LC4.

Ventilator (TL7)

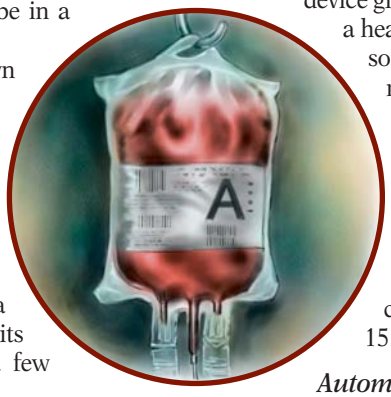
This mechanical lung or "vent" provides the correct number of breaths per minute, freeing a rescuer to do things other than pump a bag mask. $6,000, 50 lbs., external power. LC4.

Circulation

The heart circulates oxygen-carrying blood throughout the body. If this process fails, death soon follows. Healthcare professionals manage circulation in several ways.

Blood and Intravenous Fluids (TL6)

The first successful human blood transfusion is commonly credited to British physician James Blundell, who transfused blood from husband to wife in 1818. The technique didn't receive wide acceptance until WWI, however, when Britain created the first blood depots to treat the wounded coming from the trenches. Blood was stored in pint-sized glass bottles until the Korean War, when a unit of blood was likely to be in a thick plastic bag.



Since blood types were unknown until 1901, surviving an early transfusion experiment depended on a lucky match – or on the procedure failing to transfer blood! At TL6, blood-group testing is a laboratory procedure requiring refrigerated samples and either several hours of wait time or about 15 minutes and a centrifuge. At TL7-8, portable test kits produce results in minutes from a few drops of blood.

Blood or intravenous (IV) fluids can help stabilize a patient who has lost blood or become dehydrated. Most IV solutions consist largely of sterile water with small amounts of sugar and salt – although milk was used as a blood substitute in the late 1800s! An IV drip can also deliver drugs over the course of hours or days.

Blood or IV fluids are required for any First Aid gear to claim the +2 (quality) bonus for fine-quality equipment. Otherwise, the best possible quality modifier is +1. Additionally, each bag of IV fluid received counts as drinking a quart of water for hydration purposes (see *Dehydration,* p. B426). A sugar solution *also* counts as a meal for FP- and HP-recovery purposes – but long-term, a patient who can't eat will need a stomach tube to receive food.

Starting an IV takes a minute. Most IV solutions are delivered over 4-6 hours.

IV Kit (TL6). The needle, tubing, regulator, etc., needed to get an IV solution from its bottle or bag and into the patient. $15, 0.5 lb. LC3-4.*

IV Stand (TL6). This is a stand that holds IV fluids and other related equipment. It may be the only weapon that a combative patient can easily lay hands on – treat as clumsy maul at -2 to skill and -3 to damage! $75, 15 lbs. LC4.

Plasma (TL6). Dehydrated; requires half a pint of water. Shelf life is one year. Per pint: $200, 0.5 lbs. LC3-4.*

Whole Blood (TL6). Lasts a week in the fridge at TL6; a little over a month at TL8. Per pint: $150, 1 lb. LC3-4.*

Dextrose (TL7). For meal replacement. $4, 2 lbs. LC3-4.*

Saline (TL7). For hydration. $3, 2 lbs. LC3-4.*

* LC3 where a prescription is required, LC4 elsewhere.

Cardiopulmonary Resuscitation (TL7)

The fundamentals of cardiopulmonary resuscitation (CPR) are known at late TL6, but the technique isn't commonly taught until TL7; see *Resuscitation* (p. B425). Make a First Aid roll to give CPR. Manual CPR – rescue breaths, chest compressions, etc. – costs the aid provider 1 FP per five minutes.

A critical advance in resuscitation is the *defibrillator.* This device electrically shocks the heart back into action or into a productive rhythm, greatly increasing the patient's odds of survival.

Manual Defibrillator (TL7)

On a successful Electronics Operation (Medical) roll, this device gives a bonus to resuscitation rolls (p. B425). It has a heavy-duty waterproof case (DR 4). If used to shock someone as an improvised weapon, the victim must make a HT-4 roll; failure produces the results described for *Nonlethal Electrical Damage* (p. B432).

Manual Defibrillator (TL7). Gives +2 to resuscitation rolls. Prints its output on a paper strip. $10,000, 60 lbs., L/20 uses. LC3.

Manual Defibrillator (TL8). Gives +3 to resuscitation rolls. Often has a digital readout. $10,000, 15 lbs., L/20 uses. LC3.

Automatic External Defibrillator (AED) (TL8)

This miniature defibrillator has a dedicated computer that analyzes the patient's heart rhythm and delivers a shock. The human operator need only hook it up to the subject by following audio instructions, cartoons, etc. (an IQ+4 roll). The AED then performs resuscitation with an effective skill of 12. It's designed specifically *not* to allow abuse as a weapon! The internal battery is good for 30 shocks and has a five-year shelf life. $1,200, 3 lbs. LC4.

First Aid Kits and Doctor's Bags

These are kits for providing medical assistance in the field. Their contents grow more advanced with TL, but the quality bonuses don't change. Higher-TL kits *are* more effective in other ways, however; see *Recovery* (pp. B423-425).

Kits grow depleted after several treatments (GM's decision). The reusable tools that remain let a depleted kit function at the next-lowest quality level. Grades are fine (+2), good (+1), basic (0), and improvised (-5); see p. B345.

Doctor's Bag (TL5)

This gear gives +1 (quality) to First Aid, and counts as *basic* equipment for Physician and *improvised* equipment for Surgery. At TL5, the major contents of a frontier doctor or field surgeon's kit might be two dozen bandages (p. 221), four small boards for splinting, an otological reflector (p. 222), a percussor (p. 222), a stethoscope (p. 222), a suturing kit (p. 224), four doses of chloroform or ether (p. 224), 10 doses of quinine (p. 226), 20 doses of castor oil (p. 226),

Hygiene and Healthcare

Several day-to-day measures can *prevent* health problems – especially in hostile environments.

Soap (TL5). Daily use gives *at least* +1 to HT rolls for *Contagion* (p. B443) and *Infection* (p. B444). Month's supply: $1, 0.25 lb. LC4.

Foot Powder (TL6). Gives +2 to resist fungal infection of the feet: "trench foot," "jungle rot," etc. Week's supply: $4, 0.5 lb. LC4.

Insect Repellant (TL6). Gives +3 to resist insect-borne diseases. A 10-use bottle of "mosquito dope": $2, 0.25 lb. LC4.

Salt Tablets (TL6). Prevent dehydration, giving +1 to HT rolls to avoid FP loss due to heat (see *Heat,* p. B434). Each tablet treats a quart of water. Bottle of 50 tablets: $1, 0.1 lb. LC4.

Sunscreen (TL6). Provides DR 2 vs. sunburn (see *Heat,* p. B434) for 2-4 hours. Four-use bottle: $2, 0.25 lb. LC4.

Vitamin Pills (TL7). Compensate for poor diets, allowing subsistence on nutritionally inadequate food. Month's supply: $3, 0.1 lb. LC4.

Hand Sanitizer Gel (TL8). Kills most germs in seconds and then evaporates. Regular use gives *at least* +1 to HT rolls for *Contagion* (p. B443). Week's supply: $1, 0.01 lb. LC4.

six doses of morphine (p. 226), and a notebook (p. 17) with a pencil, all in a leather handbag (p. 31). $200, 10 lbs. LC3.

First Aid Kits (TL6)

Soldiers often carry small first aid kits. A medic *can* claim +1 for a full-sized kit or +2 for a crash kit while using consumables from the patient's kit to avoid depleting his supplies.

Small First Aid Kit (TL6). This is *basic* equipment for First Aid. It can treat one major wound or a couple of smaller ones. At TL6, a soldier's individual kit might contain a handful of bandages (see right), an autoinjector with a dose of morphine (226), and two doses of sulfa drugs (see *Antibiotics*, p. 226). $10, 1 lb. LC4.

First Aid Kit (TL7). This kit gives +1 (quality) to First Aid. It contains *more* of everything in the small kit, plus foot powder (see box), insect repellant (see box), salt tablets (see box), ammonia inhalants (p. 226), analgesics (p. 226), antibiotic ointment (see *Antibiotics*, p. 226), antimalarial pills (p. 226), and water purification tablets (p. 59). $50, 2 lbs. LC4.

Crash Kit (TL8)

This gear is typical of what a military medic or a civilian EMT might carry. It gives +2 (quality) to First Aid, and counts as *basic* equipment for Physician and *improvised* equipment for Surgery. At TL8, typical contents are more of everything in the large first aid kit (above), plus splinting material, a bag mask (p. 219), an IV kit with a unit of blood, plasma, or other fluids (p. 220), a clinical thermometer (pp. 221-222), a stethoscope (p. 222), a sphygmomanometer (p. 222), a suturing kit (p. 224), and a micro-flashlight (p. 52). $200, 10 lbs. LC3.

Miscellaneous Emergency Equipment

Medics may find these items useful in emergency-response situations:

Bandages (TL5). Lint at TL5, sterile gauze at TL6-7, or spray-on bandage at TL8. See *Bandaging* (p. B424). Enough for one wound: $1, 0.1 lb. LC4.

Litter (TL5). For carrying the wounded. $50, 25 lbs. LC4.

Body Bag (TL6). With full-length zipper and tiedowns. $5, 2.5 lbs. LC4.

Hemostatic Bandages (TL8). Bandages impregnated with a protein – derived from insect chitin – that promotes clotting. This *significantly* reduces bleeding. When bandaging a bleeding wound (p. B424), these give +1 (quality) to First Aid and reduce the time required to 30 seconds. Per treatment: $20, neg. LC4.

Lightweight Litter (TL8). This folding aluminum litter stows in a backpack. $500, 12 lbs. LC4.

Medical Equipment

Hospitals and doctor's offices are packed with specialized tools. Few are likely to matter to adventurers, but some are *iconic* – like a doctor's stethoscope – while others are useful as scenery or plot devices. Much of this equipment requires rolls against Diagnosis and/or Electronics Operation (Medical) to operate, as indicated. Everything else uses the Physician skill.

Basic Diagnostic Instruments (TL5)

These items – often found in a doctor's bag, a medic's pouch, or an ambulance – *collectively* constitute basic equipment for the Diagnosis skill. The GM might let a subset suffice, where appropriate; e.g., a stethoscope and a sphygmomanometer would be basic equipment for detecting a heart problem but *not* for diagnosing a hairline fracture of the left tibia.

Clinical Thermometers (TL5)

A clinical thermometer measures body temperature – a useful indicator of the progression of some diseases. At TL5, such instruments are over a foot long and take almost half an hour to register a temperature. In use by the 1840s in Europe, they weren't widely accepted in the U.S. until the late 1800s.

Mercury Thermometer (TL6). The familiar small glass tube filled with mercury. $10, neg. LC4.

Outbreak!

Epidemiology is the study of diseases – chiefly epidemics – in human populations. The worst epidemic in modern history was the influenza pandemic of 1918-1919 (the "Spanish Flu"), which killed at least 30 million people worldwide. In the U.S., a third of the nation contracted the disease, crippling medical response, and there were over half a million deaths. Public gatherings were banned and the sick filled school gymnasiums. Coffins couldn't be built fast enough. New graveyards were created across the country and city governments used prison inmates as grave-diggers.

Expert Skill (Epidemiology) (p. B194) addresses *how* and *why* diseases spread; make a skill roll to identify an obscure ailment from a live subject's symptoms or by investigating the dwelling, water sources, clothing, etc., of a victim (living or dead). Use Physician (p. B213) to administer treatment in the post-identification phase. Designing vaccines requires Bioengineering (Vaccines) – a new specialty of Bioengineering (p. B180). Anyone dealing with an outbreak in the field needs NBC Suit (p. B192) for suits and masks, and Hazardous Materials (p. B199) to operate containment gear.

Disease-Control Equipment

This is containment gear. For *personal* protection, see Chapter 4.

Decontamination Shower (TL6). This one-person shower catches contaminants and pumps them into drums. Set up at the edge of a HazMat safe zone, everybody coming in or out must move through it. $600, 150 lbs. LC3.

Decontamination Sprayer (TL6). Has enough decontaminant for 10 people or two vehicles. Halve weight at TL8. $500, 35 lbs. LC3.

Portable Isolation Dome (TL7). A light plastic dome with an airlock and glove inserts, for handling hazards. DR 3. $500, 5 lbs. LC4.

Quarantine Tent (TL7). A tent sealed against chemical and biological threats, with an airlock and a filter system. Has enough space for a couple of examination tables and ancillary equipment. DR 1. $2,000, 50 lbs., external power. LC3.

Stretcher Isolator (TL7). A sealed stretcher on wheels, with glove inserts, biomedical sensors (like those on p. 75, but not miniaturized), and an intercom. Requires air tanks (p. 74). $500, 500 lbs., L/10 hrs. LC3.

Casualty Bag (TL8). A sealed bag with a battery-powered filter, for short-term HazMat evacuations. $100, 5 lbs., M/2 hrs. LC4.

Electronic Thermometer (TL8). This infrared sensor instantly reads temperature through the ear canal. $30, neg., 2×T/1,000 readings. LC4.

Otological Reflector (TL5)

This circular metal mirror is designed to reflect light from a nearby candle or lamp, thereby illuminating a patient's ear cavity or mouth. The examiner wears it on a headband and peers through a tiny central hole.

Otological Reflector (TL5). $50, 0.25 lb. LC4.

Otoscope (TL7). The reflector's modern replacement is a battery-powered penlight with a gooseneck viewer on one end. $150, 0.25 lb., 2×S/10 hrs. LC4.

Percussor (TL5)

A *percussor* is a small, rubber-tipped hammer. When tapped on a *pleximeter* (a plate the size of a silver dollar) placed on the patient's chest, the resulting sounds can reveal fluid in the lungs – a symptom of pneumonia. Used on the joints – the famous knee-jerk test – it can help diagnose neurological damage. $10, 0.25 lb. LC4.

Stethoscope (TL5)

The stethoscope allows an examiner to listen to the heart and lungs. Prior to its invention, physicians placed an ear directly to the patient's chest. Early models were stiff and cumbersome. The recognizable modern instrument is a TL6 design. See also *Electronic Stethoscope* (p. 213). $15, 0.25 lb. LC4.

Sphygmomanometer (TL6)

A *sphygmomanometer* measures blood pressure. Experiments in the 1840s were invasive – essentially controlled bloodletting wherein blood was fed to a pressure gauge. Noninvasive blood-pressure measurement dates to the 1890s. By the 1930s, the familiar "blood-pressure cuff" was a standard diagnostic tool. $20, 0.5 lb. LC4.

Iron Lung (TL6)

This coffin-sized chamber encloses the patient's entire body below the head. Pumps expel air from the device, generating suction that pulls the subject's chest outward to draw air into the lungs, and then reverse to force exhalation. A hand pump allows use during power outages. An iron lung serves the same purpose as the equipment under *Breathing* (p. 219), and is functionally a low-tech ventilator. $5,000, 700 lbs., external power. LC4.

Medical Imaging (TL6)

Medical-imaging instruments look *inside* the patient's body. A successful Electronics Operation (Medical) roll by the operator lets a medical professional – who needn't be the same person – attempt a *new* Diagnosis roll at +TL/2 (quality) when diagnosing applicable conditions. Where appropriate, an endoscope (p. 209) or a subminiature video bug (p. 210) can be used instead, giving +2 (quality) to Diagnosis.

X-Ray Machines (TL6)

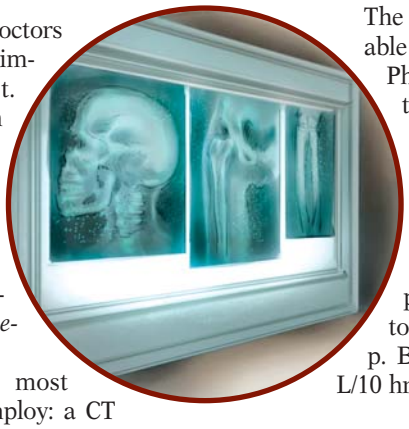
In 1895, Wilhelm Röntgen discovered X-rays. His research excited laymen and scientists alike. Early X-ray machines appeared in 1896, and were more often encountered on circus midways than at medical facilities! By the 1920s, though, most large cities had a hospital with X-ray equipment.

X-Ray Machine (TL6). This is little more than an X-ray source and a place to put a photographic film. At TL6, radiation isn't well-understood; both patient and operator receive 1d rads per photograph (see *Radiation,* p. B435). $15,000, 1 ton, external power. LC3.

Portable X-Ray Machine (TL7). As above, but smaller and *shielded* for safety; the patient receives 0.01 to 3 rads from a series of X-rays. If deliberately set to maximum intensity, the machine could expose a victim to 1,000 rads per hour. $30,000, 500 lbs., external power. LC3.

Compact X-Ray Machine (TL8). The smallest X-ray machine is about the size of shoebox. It still requires a stand, a power supply, and a back plate for diagnostic use. $12,000, 14 lbs., external power. LC3.

CT and MRI Scanners (TL7)



These imaging devices allow doctors to diagnose patients in ways that simple X-ray machines do not. *Computed tomography* (CT), which dates to the 1970s, and *magnetic resonance imaging* (MRI), used clinically from the 1980s, combine computers with strong emitters to scan the body in thin slices. The resulting "pictures" are assembled into a detailed *three-dimensional* image of the subject.

The two technologies differ most markedly in the emitters they employ: a CT scanner uses precise X-ray beams while an MRI device relies on pulses of radio energy in the field of powerful superconducting magnets. A CT scan has a higher resolution than MRI but doesn't image soft tissue as well; MRI is a better choice for examining the brain and spine. Both sorts of devices also work on nonliving objects; archaeologists routinely use CT scans to study the internal structure of mummies, pottery, and other artifacts.

A basic scanner of either kind is $500,000, 3 tons, external power. LC3.

Ultrasound (TL7)

Ultrasound technology uses high-frequency sound waves to scan the body and generate an image of what's going on inside. The first medical ultrasound was performed in 1953, with equipment that had been used for industrial materials testing for years.

Semi-Portable Ultrasound (TL7). Usually mounted on a cart. Takes five minutes to warm up. $150,000, 400 lbs., external power. LC3.

Portable Ultrasound (TL8). The size of a PDA. Used on the battlefield to assess internal bleeding and the like. $25,000, 1.6 lbs., S/2 hrs. LC3.

Medical Supplies (TL6)

The drugs, bandages, syringes, and other consumable supplies available at TL6-8 give +1 (quality) to Physician. Without this gear, a TL6-8 doctor functions as if TL5 for the purposes of *Medical Care* (p. B424). Enough for 20 patient-days of treatment: $500, 5 lbs. LC3.

Hyperbaric Chamber (TL8)

Made of flexible, airtight fabrics, this portable, coffin-sized pressure chamber is used to treat altitude sickness (see *Atmospheric Pressure,* p. B429) and the bends (p. B435). $2,500, 14 lbs., L/10 hrs. LC3.

Portable Clinical Analyzer (TL8)

This electronic device is the size of a large handheld remote control. A small quantity of blood is placed on a test strip ($5, neg.), which is then inserted into the unit. The analyzer returns immediate results for a collection of common blood tests (cholesterol, ketones, lipids, sodium, potassium, chloride, glucose, etc.); details vary by strip type. This gives +2 (quality) to Diagnosis where blood testing would be helpful. $5,000, 1.5 lbs., 2×XS/300 tests. LC4.

Surgery

"The old sawbones" uses a great deal of technology to ply his trade, some of which is valuable to adventurers in general. These items and procedures call for Surgery rolls, unless noted otherwise.

Surgical Tools

The consequences of failure make improvised equipment especially undesirable for the Surgery skill. Surgeons normally work with the best tools they can lay their hands on. See *Surgery* (p. B424) for rules governing this hardware.

Basic Surgical Tools (TL5)

These kits constitute basic equipment for Surgery – a minimalist setup that can fit into a large case or a backpack. Each has a built-in TL-dependent skill modifier. This is cumulative with *Equipment Modifiers* (p. B345), but note that high-quality tools use the prices under *Surgical Theaters* (p. 224) instead of 5× or 20× cost.

A well-maintained surgical kit can last a lifetime. Certain supplies – needles, scalpel blades, suturing material, sponges, etc. – require replenishment after each surgery, however. This costs 10% of kit price at TL5, rising to 20% at TL6-8.

Surgical Kit (TL5). Contents include scalpels, saws, chisels, shears, tweezers, sponges, retractors for holding wounds open, and a primitive rotary saw powered by pumping the grip. Many parts are crafted from wood, ivory, etc., rather than metal, making sterilization nearly impossible. Suturing material is "catgut," made from bovine intestine; removal is unnecessary, as human tissue absorbs it. -2 to skill. $300, 15 lbs. LC4.

Backyard Docs and Body Shops

Adventurers in trouble might not have the option of seeking legitimate medical help – often because they're short on cash or wish to avoid trouble with the authorities. Enter the "backyard doc." This might be an unlicensed dentist operating out of a filthy tenement and preying on the poor . . . or a hotshot surgeon treating celebrities at a private mountain resort. Costs can run from cut-rate to exorbitant; quality, from first-class to quackery.

The best backyard doc is an able former professional with a troubled background. Perhaps he lost his license after a messy court battle, or was set up by a vindictive employee. Maybe he's an immigrant whose foreign credentials aren't officially recognized. He probably has a white-collar day job – but on the side he runs a tidy little medical practice, doing favors for licensed doctors in exchange for equipment and supplies, and providing services to those in the know at 10% of the going rate. He's likely to have clean facilities and modern tools, but a limited supply of drugs. He might even have a key to a licensed doctor friend's clinic in case some serious need crops up. It's estimated that *thousands* of unlicensed doctors operate such businesses in the U.S., avoiding taxes and regulation, and gaining clients by word of mouth.

There are seedier options, of course. A washed-out alcoholic with shaky hands may be the only doctor who will treat a gunshot wound at 3 a.m., no questions asked. The risks are high: dirty, obsolete tools, antibiotics (if any) well past their expiration date, and a slug of whiskey as "anesthesia." His sutures might look like the work of Dr. Frankenstein. He can, however, save a life and keep his mouth shut.

Surgical Kit (TL6). Instruments include precision locking forceps, small and specialized scalpels, and other all-metal tools that are easy to clean and sterilize. The reusable needles and scalpels require occasional sharpening. The included suturing material is *sterilized.* $300, 15 lbs. LC4.

Surgical Kit (TL7). These light, ergonomically designed instruments allow lengthy procedures that don't fatigue the surgeon, and include micro-tools for dealing with tiny vascular problems. Many components are disposable; needles and scalpels, sharpened to a keen edge at the factory, are discarded after a single operation. Everything is hypoallergenic and easily sterilized. +1 to skill. $300, 15 lbs. LC4.

Surgical Kit (TL8). As TL7, but adds micromanipulators for handling nerves, plus scalpels and scissors with micron-thin cutting edges. Rechargeable batteries power a sizable portion of the tools, allowing quicker, less labor-intensive, and more finely tuned work. Many items are constructed from titanium and exotic alloys. Interestingly, catgut is *still* used for suturing. +2 to skill. $300, 15 lbs. LC4.

Surgical Theaters (TL5)

Sometimes a surgeon needs more than just a bone saw and a scalpel. Generally, treating a major wound or performing reconstructive surgery (e.g., repairing a crippled limb) demands a surgical theater. Such equipment requires external power at TL6-8.

Operating Theater (TL5)

This is an entire room full of specialized gear – including the best anesthesia equipment (see *Anesthesia,* pp. 224-225) for the TL. It gives +2 (quality) to Surgery. $200,000, 1,000 lbs. LC3.

Portable Surgery (TL5)

This complete surgical setup typically travels in a utility vehicle, a trailer, or a large hospital cart, and includes portable anesthesia equipment appropriate to the TL. The military often uses it as a mobile field surgery. Packing or unpacking it takes *at least* five minutes; half an hour is more typical. It gives +1 (quality) to Surgery and +2 (quality) to First Aid. $50,000, 500 lbs. LC3.

Specialized Operating Theater (TL6)

As *Operating Theater* (above), but dedicated to a single Surgery specialty; e.g., neurosurgery or heart surgery. It gives +TL/2 (quality) to *that* specialty but counts as basic equipment for other purposes. $1,000,000, 1,000 lbs. LC3.

Suturing Kit (TL6)

Commonly found in paramedic bags and crash kits, and sometimes sold as a "surgical kit" by military surplus stores, this gear counts as basic equipment for *simple* applications of Surgery; e.g., stitching non-major wounds. It's improvised equipment – giving -5 (quality) – for all other purposes, including treating major wounds. The GM decides which tasks are "simple." $20, 1 lb. LC4.

Surgical Laser (TL8)

This multi-purpose tool can cut flesh, debride a burn, or administer cosmetic surgery (p. 225), and counts as fine-quality Surgery equipment. It inflicts at most 1d-3 tight-beam burning damage. $100,000, 200 lbs., external power. LC3.

Anesthesia

After 1850, anesthesia for surgery was commonly available in Europe and the U.S. – including at most American Civil War field hospitals, contrary to popular myth. Inhalant anesthetics are volatile, and require storage in airtight containers until shortly before use. It takes about a minute to put a cooperative patient under, or three to five minutes for an uncooperative one. If the roll to administer anesthetic fails, Surgery skill is at -2, just as for no anesthetic (see *Surgery,* p. B424).

These rules cover *general* anesthesia. Local anesthetics for minor surgery are available after 1885, and are included in medical kits that need them.

Chloroform or Ether Mask (TL5)

Make a Physician roll to use this device to administer chloroform or ether. Each dose costs $5. $50, 2 lbs. (plus anesthetic). LC3.

Portable Anesthesia Machine (TL6)

Make a Physician roll at +2 for this gear. A tank ($150, 25 lbs.) lasts four hours. $2,000, 40 lbs. (plus tank). LC3.

Antisepsis

Cleanliness wasn't strongly emphasized in medical care until the germ theory of disease gained acceptance, thanks principally to Louis Pasteur and Robert Koch's work in the 1860s and 1870s. After 1870, antiseptic use greatly reduced mortality. The first widely used antiseptic was carbolic acid, an aqueous solution of phenol, with which Joseph Lister covered his operating theater in the mid-1860s. Alcohol, iodine, and hydrogen peroxide soon followed. In 1887, Robert Wood Johnson and his brothers created a small company, Johnson & Johnson, to produce the first antiseptic bandages.

Antisepsis is especially relevant to surgery: operations that were usually fatal in 1840 were routinely successful in 1900. Surgery in a non-sterile environment counts as "infected matter in the wound"; see *Infection* (p. B444). Surgery with properly sterilized equipment and antiseptic technology won't normally result in infection.

Antiseptic (TL5)

Prior to antibiotics (p. 226), the only direct treatment for a contaminated wound was to flush it with antiseptic. Cleaning a wound with antiseptic removes -2 from HT rolls to avoid infection (p. B444) and requires no skill roll. A 10-use container of phenol, iodine, etc., as appropriate for the TL: $5, 1 lb. LC4.

Elective Surgery

Surgical body modification is beyond the scope of ***High-Tech.*** If it's vital to the campaign, ***GURPS Bio-Tech*** is indispensable! Still, some procedures common in reality and fiction merit mention. The GM may wish to charge character points for beneficial changes; see *Body Modification* (p. B294).

Cosmetic Surgery (TL7)

The aim of cosmetic surgery – often called "plastic surgery" – is to alter one's looks. Recovery takes from weeks to months, depending on the level of nip and tuck desired. Such operations aren't without their dangers. Possible complications include infection, irreparable nerve damage, and one or more levels of reduced Appearance.

Removing Fingerprints (TL6). Bank robber John Dillinger dipped his fingers in acid in an effort to remove his fingerprints. Removing the skin from the fingers is effective . . . but leaves scars that are just as distinctive. It's easier to wear gloves! In a cinematic game, surgically removing fingerprints costs $1,000 per hand. LC2.

Changing Body (TL7). Surgically removing fat tissue through such techniques as liposuction – or grafting it *onto* the body – can safely alter build (pp. B18-19) by one step in either direction. Allowed levels are Very Fat, Fat, Overweight, normal build, and Skinny, in that order. After the operation, adjust weight accordingly. Recovery takes a week. $5,000. LC4.

Improving Appearance (TL7). Starting in the 1950s, a variety of procedures – collagen injections, facelifts, etc. – can improve Appearance (p. B21) to Attractive (TL7, $4,000), Handsome/Beautiful (TL7, $8,000), or Very Handsome/Very Beautiful (TL8, $12,000). Each step is its own operation! Recovery takes a week per operation. LC4.

Improving Vision (TL8)

Laser surgery on the eyes can cure Bad Sight (p. B123). This costs $2,000 per eye. Recovery takes a couple of days. LC4.

Prosthetics

Medical prosthetics are Mitigators (p. B112) that let the wearer partly "buy off" crippling disadvantages. Many give lesser disadvantages – they don't eliminate the problem completely. If a PC acquires prosthetics to treat disabilities for which he claimed points, the GM may require him to pay back the point difference between his original condition and the replacement traits specified for his prosthetics.

Eyeglasses (TL5)

Eyeglasses correct Bad Sight and provide minor eye protection as described for *Glasses* (p. 71), but are *fragile.* Roll 1d if struck in the head: on a 1, they break; on 2-3, they're knocked off. Spares are advisable! Teddy Roosevelt routinely carried an extra pair or two . . . which was fortunate, because a pair was shot off his face during the Rough Riders' famous charge up Kettle Hill in the Spanish-American War.

Eyeglasses (TL5). Replace Bad Sight [-25] with Bad Sight (Mitigator, -60%) [-10]. $150, neg. LC4.

Contact Lenses (TL7). These can't get knocked off or broken, but provide no eye protection and may *melt* if exposed to harsh chemicals (the GM may assess -1 or worse to rolls to avoid eye injury). Otherwise, treat as glasses. $150, neg. LC4.

Prosthetic Limbs (TL5)

The best TL5 prosthetic limb (contemporary with the American Civil War) has a suction-fitted socket, hinges at natural locations, action controlled by catgut lines, and a rubber foot or hand. At TL6, the structure is aluminum rather than wood or iron; walking is possible, but arms can only crudely grasp. Well-designed TL7 models have electric- or hydraulic-powered joints, and sensors to detect and direct action, making grasping or running possible – but arms are still less-advanced than legs. By TL8, microprocessors, myoelectrics, and advanced alloys let prosthetic limbs work much like real ones.

Basic Arm Prosthetic (TL5). Replace One Arm [-20] with Ham-Fisted 2 (One Arm, -40%) [-6] *and* One Arm (Mitigator, -70%) [-6]. $2,000, 3 lbs. LC4.

Basic Leg Prosthetic (TL5). Replace Missing Legs [-20] with Missing Legs (Mitigator, -70%) [-6], *and* apply Mitigator, -70% to one point of reduced Basic Move. $2,000, 6 lbs. LC4.

Advanced Arm Prosthetic (TL8). Replace One Arm [-20] with One Arm (Mitigator, -70%) [-6]; 8 hours between recharges. $40,000, 2.5 lbs. LC4.

Advanced Leg Prosthetic (TL8). Replace Missing Legs [-20] with Missing Legs (Mitigator, -70%) [-6], *and* apply Mitigator, -70% to all reduced Basic Move; 30 hours between recharges. $40,000, 5 lbs. LC4.

Hearing Aid (TL8)

Replace Hard of Hearing [-10] with Hard of Hearing (Mitigator, -60%) [-4]. $500, neg., T/400 hrs. LC4.

Wheelchairs

Wheelchairs let those who can't walk retain some mobility. The muscle-powered version described on p. B142 is $300, 40 lbs. at TL8.

Electric Wheelchair (TL6). An electric wheelchair has Move 3 and can operate for two hours. $1,500, 150 lbs. LC4.

Advanced Wheelchair (TL8). This high-tech model can balance on two wheels (raising the occupant to eye level with a standing person) or cruise at Move 3 on four wheels. Its wheel arrangement lets it handle curbs and even stairs (a step per second). $30,000, 250 lbs., VL/6 hrs. LC4.

Drugs and Poisons

Substances with medical benefits – real or imagined – are "drugs." Those used to kill are "poisons." The distinction frequently turns on dosage and intent. Critical failure on a Physician roll to prescribe or administer medication, or on a Pharmacy roll to prepare it, may poison the patient!

See *Poison* (pp. B437-441) for important rules relevant to drugs *and* poisons.

Drugs

Most TL5 medications are experimental and dangerous. Starting at TL6, the situation improves greatly.

Ammonia Inhalants (TL5)

Waved under a stunned or unconscious person's nose, "smelling salts" allow a HT roll to recover immediately. $0.20/vial (good for 20 uses). LC4.

Castor Oil (TL5)

This purgative – billed as a "cure-all elixir" in the 1800s and used as a punitive prescription for naughty children long afterward – *might* give +1 to HT rolls made to avoid the ongoing effects of some stomach ailments and digestive poisons. $1/10 doses. LC4.

Morphine (TL5)

Morphine became available in the early 1800s and saw widespread use during the American Civil War. It and similar powerful analgesics use the rules given for painkillers under *Depressants* (p. B441). $1/dose. LC3.

Quinine (TL5)

Quinine gives +3 to HT rolls to recover from malaria symptoms. At TL5, *preventative* use is understood: daily doses before, during, and after travel in a malarial area grant +5 to HT rolls to avoid contracting the disease. $1/dose. LC3.

Activated Charcoal (TL6)

Activated charcoal can help neutralize and limit further damage from many common digestive poisons, including arsenic and strychnine. It adds +3 to HT rolls for this purpose. $1/dose. LC4.

Analgesics (TL6)

Aspirin and similar mild pain relievers negate -1 or -2 in penalties from pain (p. B428) *after* adjusting for High or Low Pain Threshold. They're also useful against hangovers (p. B440). $3/100 doses. LC4.

Antibiotics (TL6)

Sulfa drugs are available starting in 1936; Penicillin, from 1944. Antibiotics grant +TL/2 to HT rolls against *bacterial* disease or infection (see pp. B443-444). Resistant bacteria reduce or negate the bonus! $0.50/dose to treat a wound, or $10/two-week course to treat an illness. LC3.

Antibiotic ointment (TL7) on a wound gives +TL/2 to HT rolls vs. infection. $5/10-dose tube. LC4.

Antimalarial Pills (TL6)

A bitter yellow pill, Atabrine is similar in effect to quinine (see left). Given weekly or daily, it may make the patient slightly nauseous. $5/30 doses. LC4.

Antitoxin Kit (TL6)

This gives from +1 to +TL/2 to HT rolls against one *specific* poison. Available for many types of venom, but not for all toxins! $10-$500/dose. LC3.

Chelating Agents (TL7)

This cocktail of drugs removes radioactive matter from the body; see *Radiation Treatment* (p. B436). It also eliminates metals such as antimony, arsenic, and lead, giving +TL/2 to HT rolls against poisoning. $500/treatment. LC3.

Psychiatric Drugs (TL7)

At TL7-8, drug therapy can keep many psychiatric and neurological problems at bay. Treat this as a Mitigator (p. B112) on the affected disadvantages. Candidates include Chronic Depression, Epilepsy, Flashbacks, Lunacy, Manic-Depressive, Paranoia, Phantom Voices, Short Attention Span, and Split Personality.

Drugs potent enough to banish such conditions completely often come with side effects, which can be as bad as the problem they treat. Sometimes, they're worse! Possibilities include Absent-Mindedness, Addiction, Bad Temper, Confused, Extra Sleep, Impulsiveness, Indecisive, Insomniac, Killjoy, Laziness, Light Sleeper, Low Pain Threshold, Motion Sickness, Overconfidence, Overweight, Paranoia, Short Attention Span, Slow Riser, and Unfit. Some effects can be caused *or* treated! Price varies. LC3.

Covert-Ops Drugs

While these agents have medical applications, their sinister uses are of greater concern to adventurers.

Truth Serum (TL6)

Sedatives like Sodium Pentothal and Sodium Amytal are used for drug-assisted interrogation (*narcoanalysis*). After 30 seconds, the subject loses 1d FP. He must also make a HT-1 roll to avoid -2 to Will and to self-control rolls for mental disadvantages for the next (20 - HT)/2 minutes. $10/dose. LC2.

DMSO (TL7)

Dimethyl sulfoxide (DMSO), a solvent derived from wood pulp, is remarkable mainly because it can carry other substances through the skin. In game terms, one dose allows a dose of any blood or digestive agent to function as a contact agent. $0.20/dose. LC4.

Poisons

Perhaps the best-known user of poisons in recent times was the Soviet Union. In 1954, Soviet assassin Nikolai Khokhlov defected to the CIA after warning the man he was assigned to murder. In his possession was a silenced gun, disguised as a cigarette case and loaded with cyanide-tipped bullets. Three years later, the KGB retaliated by slipping thallium into his coffee. Khokhlov survived – barely – despite losing all his hair, turning brown, and seeping blood from his pores. In the 1970s, several unrelated KGB assassination attempts involved umbrellas designed to deliver ricin-laced pellets.

High-tech assassins may use the toxins below or those under *Poison Examples* (p. B439). The effects of poisoning include coughing, nausea, choking, paralysis, retching, and seizures; for rules, see *Afflictions* (pp. B428-429).

Curare (TL5)

Curare, long used by tribal cultures of the Amazon, is produced from the vine *Strychnos toxifera.* Scientists first observed its effects in the early 19th century. It's a follow-up poison with a one-minute delay and a HT-6 roll to resist. It causes 2d toxic damage regardless of the roll; any failure indicates paralysis as well, and critical failure adds choking. This repeats at 30-minute intervals for four cycles. An antitoxin is available; it takes 30 minutes to work. $50/dose. LC1.

Ricin (TL6)

Ricin is a blood, digestive, and respiratory agent extracted from the seeds of castor beans (*Ricinus communis*). After an eight-hour delay, the victim must make a HT-2 roll. Regardless of the roll, he suffers 3d toxic damage, nausea, and vomiting; failure means he also experiences coughing. This repeats at eight-hour intervals for 10 cycles; failure on both the initial roll *and* any future roll results in choking, which is potentially fatal. $1/dose. LC1.

Strychnine (TL6)

Strychnine is a digestive agent with a 15-minute delay. The victim suffers seizures and must make a HT roll to avoid choking. This repeats at five-minute intervals for 2d hours. $5/dose. LC1.

Botulin Toxins (TL7)

These digestive agents are produced by the bacterium *Clostridium botulinum.* After a 12-hour delay, the victim suffers 4d toxic damage, nausea, and retching. At the next 12-hour interval, he must make a HT-1 roll to avoid paralysis, with each consecutive 12-hour cycle increasing the HT penalty by -1 (e.g., after 48 hours, the subject must roll HT-3 to avoid paralysis). The neurological damage the paralysis represents heals as if a lasting crippling injury (p. B422) of the lungs and spine; the victim must be immobile and on ventilation for the entirety of the healing period. An antitoxin exists, and can prevent further effects if given before paralysis sets in. $200/dose. LC1.

Irradiated Thallium (TL7)

Exposing thallium to high doses of radiation creates this insidious digestive poison. After a three-hour delay, the victim receives 1d toxic damage, repeating every 24 hours for 10 cycles. The victim *also* suffers gastrointestinal syndrome from the radiation (see *Radiation,* p. B435), and must make the usual daily HT rolls for that. $1,000/dose. LC1.

Chapter Eight
Transportation

The clerk eyed the trio with all the acumen of an elementary school teacher catching a school kid in a lie. "And how, exactly, did the HMMWV, vehicle identification number 1GCEC24R8YZ230507, suffer damage to the front left quarter panel and the right rear corner panel?"

Nat shrugged as best he could from his wheelchair.

Airk glanced at his watch and pretended not to hear the question.

Locke reached for the Colt .38 Super Auto at his waist, thought better of it, and then noticed the stun gun conveniently left on the inventory table . . .

From coaches and dawdling locomotives to supersonic jetliners, transportation advances quickly between TL5 and TL8. Adventurers can travel faster, farther, heavier, and in greater comfort – and get into more trouble – than ever before! This chapter details specific, ready-to-play vehicles. For generic shipping speeds and costs, see *Mail and Freight* (pp. 35-36).

Vehicle Statistics

Vehicle statistics appear in tables similar to those on pp. B464-465, and use the notation and abbreviations defined in *Vehicle Statistics* (pp. B462-463).

Vehicle Components

A lot of TL5-8 vehicle hardware has important game effects.

Gun Port (TL5). This small opening in the vehicle's armor – such as a firing slit or hatch – lets a single occupant shoot from relative safety. He has -1 to skill and only a 30° arc of fire, and his weapon's Bulk can't be worse than -5. Those outside attack him at -4 to -7, depending on the port's size (assume -7 for most armored vehicles). Sealed vehicles are *unsealed* while a gun port is in use.

Searchlight (TL5). This fixture projects a bright beam of light that illuminates a two-yard radius per mile of range. The beam itself can be spotted at twice its range. A searchlight requires Aim and Attack maneuvers to point in combat, and can be used to blind a single, sighted individual who's exposed or looking out a window or a canopy. This ranged attack has Acc 12 and ignores darkness penalties. The operator must make a new attack roll each turn; base skill is DX. The subject is blinded for as long as the light hits him and he remains facing it; at night, he must also make a HT roll to avoid being blinded for 1d seconds afterward. A searchlight may have a filter that lets it act as an IR illuminator; see *IR Illumination* (p. 47).

Turrets (TL5). Turrets (see *Vehicle Weapon Mounts*, p. B467) require time to rotate and bring their guns to bear. Like characters, they have a facing; see *Facing* (p. B385).

Vehicle descriptions note how many Ready maneuvers a given turret needs to change facing by 60°; multiply by two for a 120° turn, by three for a 180° turn, and so forth. While a turret is rotating, cannon within it can't usually fire – although machine guns often can.

Fire Extinguisher (TL6). An internally mounted chemical extinguisher puts out a fire immediately on a roll of TL+2 or less on 3d.

IFF (TL6). "Identify friend or foe" technology consists of a transmitter and a receiver used to identify vehicles that have been detected but not yet identified. It "interrogates" the target by sending an encoded communicator pulse. If the target has IFF gear that has been programmed to recognize the incoming signal, it will automatically transmit a coded reply. The interrogating IFF classes the contact as "friend" if it receives the correct response but as "foe" if it receives an incorrect code or no reply.

Linked Weapons (TL6). An entire *group* of weapons may have a mechanical or electrical link that lets a gunner fire them all as one maneuver. For the purposes of *Rapid Fire* (p. B373) and *Spraying Fire* and *Suppression Fire* (p. B409), linked weapons function as a single weapon with RoF equal to the sum of the individual RoFs.

Run-Flat Tires (TL6). Tires with a solid core or strengthened sidewalls can still function moderately well if punctured – at least for a short distance, typically (TL squared) miles. They give -1 to Handling and reduce Move by 20% while running flat. See the "Wheel" hit location on p. B555 for more on flat tires.

Airbags (TL7). Each airbag protects one seated vehicle occupant, providing DR 10 against the damage described in *Whiplash and Collision* (p. B432). Activation is automatic in any collision or fall at speeds above Move 5 (10 mph). Someone caught behind an inflated airbag is unable to do anything until he frees himself; he may attempt one DX-2 roll per turn to do so. Airbags function once and must then be replaced.

CTIS (TL7). A "central tire-inflation system" is an automatic pump arrangement that maintains tire pressure even in the event of a puncture. It can cope with two flat tires on a four- or six-wheeler, three on an eight-wheeler. Simply *ignore* the effects of these flats. See the "Wheel" hit location on p. B555 for more on flat tires.

Fire-Suppression System (TL7). This consists of fire or smoke detectors linked to an automatic fire extinguisher that uses chemicals or inert gases to extinguish fires quickly. It puts out a fire immediately on a roll of TL+4 or less on 3d, and may make a second attempt in two seconds if the first one fails.

Smoke Dischargers (TL7). These multi-barrel grenade launchers fire a salvo of four to 10 smoke grenades to create a dense smokescreen; a "shot" always consists of several grenades. A typical smokescreen is 50 yards wide × 25 yards high × 25 yards deep, and located 50 yards from the vehicle facing from which it was fired – usually the turret front. The screen takes three seconds to form and disperses after 1-4 minutes. At TL8, hot, prism, and electromagnetic smoke become available; see *Smoke* (p. 171).

Sound Baffling (TL7). A variety of measures can reduce a vehicle's noise level. These include carefully masking active sound sources – especially propellers and engines – and mounting equipment so as to minimize vibrations. Sound baffling subtracts (TL-4) from rolls to hear the vehicle or detect it with microphones, sound detectors, etc.

Spaced Armor (TL7). This consists of two or more layers of armor with air in between. It's especially effective against shaped charges (pp. 182-183): multiply DR by 1.5 against HEAT and HEDP rounds before applying the armor divisor. It also negates the special effects of HESH. Early laminated armor, introduced at late TL7, employs less-effective materials and compositions, and uses the same rules.

Improved Brakes (TL8). Improvements such as antilock brakes grant +1 to Driving rolls to retain control during rapid deceleration.

Laminated Armor (TL8). Armor made up of several layers of different materials – typically ceramics, fiberglass, and/or depleted uranium sandwiched between two or more layers of conventional steel – is good at defeating shaped charges (pp. 182-183): *double* DR against HEAT and HEDP ammo before applying the armor divisor. It also negates the special effects of HESH.

Availability of Combat Vehicles

The PCs – and their adversaries – might want to acquire armed and/or armored vehicles. What's available to whom, and when, can be a complex issue. Even legitimate users sometimes encounter problems.

The earliest availability date given for a combat vehicle indicates when the design entered service. However, new hardware generally takes some time – a few months in wartime, often several years in peacetime – to reach the troops in strength. Older models can remain in active service for a *long* time; for instance, many WWII vehicles (over 60 years old!) are still in use today, primarily in the Third World. These might undergo many alterations during their service life. Upgrades such as improved engines, suspensions, weapons, armor, and fire-control constitute a multibillion-dollar industry worldwide.

All of the above assumes official users, normally the military and police. Corporations and private citizens have fewer opportunities to get at combat vehicles, with two notable exceptions: *lightly* armored automobiles, which are available to anybody with enough cash, and antiques. Hobbyists and private museums in the Western world own numerous working vintage tanks, combat aircraft, and patrol boats. The armament is usually removed or disabled, but not always (as depicted in the movie *Tank*) – and even an *unarmed* tank has many uses.

Those willing to take risks have other options. International adventurers – notably mercenaries – might be able to acquire combat vehicles in less-developed countries where there are few or no controls in place, or where the authorities can be bribed or otherwise convinced that you *really* need a few tanks. Revolutionaries with any support at all will come into possession of fighting vehicles supplied by outside sympathizers, or stolen or captured from the government. And crooks might try to *steal* vehicles from military or law-enforcement users; stolen APCs have been used successfully to spring prison inmates.

Personal Conveyances

Adventurers might choose skateboards, gliders, and similar conveyances over sports cars and jets because they're cheaper, stealthier, or simply more in keeping with personal style.

Land

Swift personal transportation on land usually involves an expensive horse until mid-TL6, after which it entails a pricy motor vehicle. Several TL5-8 contraptions offer cheaper alternatives.

Bicycles (TL5)

The earliest bicycles were ponderous iron behemoths compared to today's agile bikes. The first practical designs – *vélocipèdes* and penny-farthings – are TL5. By TL8, bikes have aluminum or carbon-fiber frames and advanced wheel construction.

All of these conveyances require the Bicycling skill (p. B180). Long-distance travel involves HT-based rolls and uses the rules under *Running* (p. B354). Riders may use the *higher* of their relative skill level and Basic Move to compute speed. Multiply downhill speed by two for a 7.5° slope, by three for a 15° slope, or by four for a 30° slope.

Example: A mountain biker with DX 10, Move 5, and Bicycling-15 (DX+5) has Move 5 × 1.5 = 7.5. Rounded down to 7, he makes about 14 mph on level ground. Down a gentle slope, Move becomes 7 × 2 = 14, or almost 29 mph.

Pedestrians often use bicycles to move cargo. A bike counts as a two-wheeled cart for this purpose; see *Pulling and Dragging* (p. B353).

The bikes below are basic models. *Equipment Modifiers* (p. B345) often apply, especially at TL7-8. Paying 5× or 20× cost buys +1 or +2 to skill, as usual.

Velocipede (TL5). The first practical bicycle, called *vélocipède,* was invented in France in 1867 and available by 1869. It had solid wheels and one speed. Heavy and uncomfortable, its English nickname "Boneshaker" was well-earned. Enhanced Move 0.5 (Ground, Road-Bound). $65, 65 lbs.

Penny-Farthing (TL5). Penny-farthing bicycles were available by 1871. They had one enormous wheel for power and a small one for balance. This design gives -1 to skill and makes any spill at least a two-yard fall! Enhanced Move 0.5 (Ground, Road-Bound). $100, 40 lbs.

Bicycle (TL6). The first "safety" bicycles – with equal-sized wheels – appeared circa 1885. By 1890, they had pneumatic tires. Modern gear systems became available around 1900. This bike has a dynamo-powered headlight and a 300-lb. maximum load. Multiply its weight by 0.8 at TL7 and by 0.5 at TL8. Enhanced Move 0.5 (Ground, Road-Bound). $50, 60 lbs.

Racing Bike (TL7). A high-speed road or touring bike, with multiple gears. High-quality versions can reach astronomical prices but give the usual skill bonus. Enhanced Move 1 (Ground, Road-Bound). $100, 20 lbs.

Off-Road Bike (TL8). A "mountain" or BMX bike. Enhanced Move 0.5 (Ground). $200, 30 lbs.

Electric Bike (TL8). A bike with an electric motor. $1,000, 50 lbs., L/2 hours.

Skateboard (TL7)

Skateboards are commercially available at TL7, although homemade jobs made from scrap lumber and discarded roller skates are probably TL6. They require the Sports (Skateboard) skill (see *Sports,* p. B222), which defaults to DX-5, Sports (Snowboard)-2, or Sports (Surfing)-2. Multiply downhill speed by two for a 7.5° slope, by three for a 15° slope, or by four for a 30° slope.

Skateboard (TL7). Enhanced Move 0.5 (Ground, Road-Bound). $100, 6 lbs.

Personal Transport Platform (PTP) (TL8)

First available in 2002, this is a gyrostabilized platform fitted with two wheels, like the Segway HT. The operator stands on the platform and leans in the direction he wishes to travel. A practical vehicle for postal carriers and traffic cops, it's powered by an electric motor with a rechargeable battery. $4,000, 70 lbs., 2×L/2 hours.

Water

At TL6-8, personal watercraft see frequent use for both recreation and military special operations.

Kayaks (TL1)

A kayak (from the Inuit *qayaq,* meaning "hunter's boat") is a light paddling boat for one to three people. Traditional kayaks – still used by Inuit hunters in North America – have wooden frames covered with animal skins. Commercially made kayaks with canvas skins appear at TL6; plastic models, at TL7.

Land Conveyances Table

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Range	Cost	Locations
BICYCLING/TL (DX-4 or Driving (Motorcycle)-4)													
8	Electric Bike	15	+1/2	10	2/5*	0.13	0.1	0	1	3	10	$1,000	E2W
8	PTP	17	+1/5	10	2/6*	0.14	0.1	0	1	3	20	$4,000	E2W

Water Conveyances Table

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Range	Cost	Locations	Draft	Notes
BOATING/TL (UNPOWERED) (DX-5, IQ-5, Boating (Large Powerboat)-4, Boating (Motorboat)-3, or Boating (Sailboat)-3)															
1	Traditional Kayak	15†	+1/2	12	2/3	0.25	0.22	0	1	1	F	$500	(M)O	1	[1]
6	Folding Kayak	18†	+1/2	10	2/2	0.5	0.45	+1	2	1	F	$350	(M)O	2	[1, 2]
8	Expedition Kayak	18†	+1/2	12	2/2	0.5	0.45	+1	2	5	F	$1,200	(M)O	2	[1]
8	Sport Kayak	15†	+1/2	12	2/3	0.25	0.22	0	1	5	F	$400	(M)O	1	[1]
SCUBA/TL (IQ-5 or Diving Suit-2)															
8	Recreational DPD	12	+2/2	10	1/2	0.12	0.1	-1	1	2	5	$1,000	E	2	
8	Special-Ops DPD	20	+2/2	10	1/2	0.19	0.13	0	1	4	4	$5,500	E	2	
SPORTS (SAILBOARDING) (DX-5, Boating (Sailboat)-5, Sports (Motorsurfing)-3, or Sports (Surfing)-2)															
7	Wind Surfboard	14†	+1/1	12	3/15	0.12	0.1	+1	1	1	–	$1,500	EM	1	[2]

Notes:

[1] Can use a removable sail; Move 2/4.

[2] Folds up for storage.

Another TL6 innovation is the folding kayak, sometimes known as the "Folbot" or "Klepper" after two of the better-known manufacturers. It uses modern materials and disassembles into a compact package. Assembly takes 15 minutes. Special-ops troops often employ these craft, which are easily deployed through a submarine's narrow hatch.

Surfboards (TL6)

It's unknown exactly when the Polynesians began surfing, but the activity was a fundamental part of Hawaiian life by the time of James Cook's visit. "Lightweight" surfboards date to the 1920s; surfing grew into a mainstay of beach culture during the 1950s. Thanks to modern materials, today's surfboard designs have only a tiny fraction of the weight of the old wooden longboards.

Surfing uses the Sports (Surfing) skill. Speed on the best waves might reach Move 12-15. Paddling is seldom faster than Move 1.

Wooden Surfboard (TL6). A traditional "longboard" of solid wood made using modern techniques. $100, 150 lbs.

Foam-Core Surfboard (TL7). A foam-core board covered in epoxy or fiberglass. $500, 15 lbs.

Carbon-Fiber Surfboard (TL8). An advanced board made of the lightest materials available. $1,200, 6 lbs.

Inflatable Surfboard (TL8). Inflates in five minutes with a built-in foot pump. Rolls up into a package the size of a sleeping bag. $500, 15 lbs.

Wind Surfboard (TL7)

Developed in the early 1960s, this is a surfboard connected to a flexible mast and sail. It's highly maneuverable, capable of loops and other tricks. It requires the Sports (Sailboarding) skill, which defaults to DX-5, Boating (Sailboat)-5, Sports (Motorsurfing)-3, or Sports (Surfing)-2.

Dive Torpedoes (TL8)

The motorized, torpedo-shaped "diver propulsion device" (DPD) lets a diver travel swiftly without fatiguing. Such machines require the Scuba skill.

Recreational DPD (TL8). The size of a large scuba tank, this model can dive to 160' and runs for about 90 minutes on its rechargeable battery.

Special-Ops DPD (TL8). This tough, powerful unit can tow a fully equipped military diver down to 400'. Its rechargeable battery lasts for about an hour. The included headlight, compass, depth gauge, and chronometer give +2 (quality) to Navigation (Sea).

Air

At TL5, the only reliable personal "flying" machines are hot-air balloons, which date to the 1780s. While experimental gliders exist, TL5 materials and engineering give them only a slim chance of flying – nobody flew one for long enough to learn Piloting (Glider)! No such conveyances are described below. If the PCs want them, they'll have to invent them (see *New Inventions,* p. B473). Statistics are up to the GM, who's encouraged to make such contraptions markedly inferior to later craft.

By TL6, technology is capable of producing a gliding wing that can *reliably* lift one man. Powered ultralights appear in the late 1970s, and are TL8.

Glider (TL6). A primitive one-man sport glider with conventional flight controls. It's normally launched by having several helpers push it rapidly down a steep hillside while the pilot sits at the controls. This is a common introduction to pilot training throughout TL6.

Rocket Belt (TL7). This impractical – and *loud* – conveyance was invented in the 1950s. Despite its annoying high-pitched whine and short flight time, it never fails to impress onlookers.

Hang-Glider (TL7). The first hang-gliders were invented in Australia in the 1960s. Maximum speed is 30 mph.

Hang-Glider (TL8). A high-performance glider of the type used by expert pilots. Maximum speed is 50 mph.

Powered Parachute (TL8). This contraption consists of two seats, an engine, a propeller, and wheels suspended beneath a steerable parachute.

Ram-Air Parachute (TL8). A steerable parachute; see *Parachutes* (p. 61). Make a Parachuting roll to deploy it from a plane. Use Piloting (Glider) to steer it.

Air Conveyances Table

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Range	Cost	Locations	Stall	Notes
PILOTING/TL (FLIGHT PACK) (IQ-6, Piloting (Vertol)-4, or other Piloting-5)															
7	Rocket Belt	16	+2/2	10x	6/30	0.13	0.1	0	1	2	0.5	$10,000	E	0	[1]
PILOTING/TL (GLIDER) (IQ-6, Piloting (Light Airplane)-2, Piloting (Ultralight)-2, or other Piloting-2)															
6	Glider	20†	+1/4	9c	0/25	0.16	0.1	+3	1	1	–	$4,000	O2WWi	7	
7	Hang-Glider	17†	+2/2	9c	0/15	0.14	0.1	+1	1	1	–	$2,000	EWi	5	[2]
8	Hang-Glider	16†	+3/2	10c	0/25	0.13	0.1	+1	1	1	–	$4,000	EWi	3	[2]
8	Powered Parachute		27	+1/4	9f	1/15	0.4	0.25	+2	1+1	1	100	$20,000	O2WWi	7
8	Ram-Air Parachute		12†	+3/4	12	0/15	0.21	0.2	+2	1	1	–	$3,500	EWi	3

Notes:

[1] Endurance is only 30 seconds!

[2] Folds up for storage.

19th-Century Stagecoach

At TL5, a stagecoach is an enclosed four-wheeled carriage with rugged spring suspension, drawn by four to six horses. The driver stops periodically at staging posts to change horses. Stagecoaches traveling along regular routes were used in Europe starting in the 17th century, but became especially popular in the late 18th century. In Britain, they officially carried the Royal Mail from 1784, which led to the term "mail coach." Similar arrangements existed elsewhere in Europe. Stagecoaches began criss-crossing the American West with passengers, mail, and gold in the mid-19th century.

Stagecoaches offer many adventure possibilities. In both Europe and the Old West, the coach was for a long time the only way to cover vast distances swiftly if you didn't have your own transportation. In Britain, many young nobles became coach drivers after gambling away their fortune, as it was a profession that could offer a cash-strapped gentleman nation-wide renown. In the Old West, flamboyant drivers could likewise become famous – consider Wyatt Earp! Being a Royal Mail guard or a Wells, Fargo messenger was another exciting and reasonably well-paid, if dangerous, job . . . and *robbing* a bullion-laden stagecoach has its own gaming opportunities. An entire campaign might revolve around a coach's crew and passengers; see the film *Stagecoach* for inspiration.

A stagecoach driver requires Teamster (Equines). The mail guard or express messenger "riding shotgun" needs Guns – and will find the Mounted Shooting technique (p. 251) useful. Both often know Mechanic (Carriage).

On the Coach Across America

Stagecoaches travel an average of 8 miles an hour (top speed is about 15 miles an hour), and can cover 100-125 miles a day. Every 10-12 miles, the coach stops at a station to change horses, and the travelers stretch their legs or brave the notoriously bad food offered at some stations: coffee, some kind of preserved meat, and beans, always beans. Passengers usually try to sleep sitting up in the coach – the journey goes on day and night. Most trips are extremely uncomfortable (due to the weather, the roads, the food, and quite often, an annoying fellow traveler) and very boring, but blizzards, runaway horse teams, robberies, and the occasional Indian attack make some journeys more exciting . . .

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Range	Cost	Locations
5	Concord Stagecoach	54†	-2/3	12c	4/8*	2.3	1.1	+3	1+10	2	F	$4,400	6D2E4W

Abbot-Downing Concord (USA, 1827-1899)

This famous vehicle was made in Concord, New Hampshire. It was without a doubt the premier American stagecoach. Over 3,000 Concord coaches were built.

The brightly colored coach body hangs on two leather straps attached to the carriage frame, giving a reasonably smooth ride over almost any road. Inside, two long, cushioned seats face each other from the front and rear, with a removable, backless leather bench in between. Each row seats three passengers, for a total of nine – although six is more usual, and even that means a claustrophobic ride! Only the windows in the side doors are glazed; canvas or leather curtains cover the others in bad weather.

The driver and express messenger sit on the box up front. This holds tools, a water bucket, and the 25-lb. strongbox (DR 10, holds 0.5 to 0.75 cubic feet of valuables). There's sometimes an external seat for three more passengers on the roof behind the driver. A large rear boot carries the passengers' baggage, express packages, and the mail.

WWI Biplane Fighter/Bomber

Mid-TL6 military aircraft evolve with prodigious speed from flimsy, unarmed reconnaissance planes to full-fledged combat machines with dedicated armament. Early fighter/bombers are generally two-seat biplanes intended for such missions as close-support, photoreconnaissance, and artillery spotting. Fixed machine guns fired by the pilot and flexible MGs operated by the observer are used against both ground targets and enemy aircraft. Hardpoints under the wings carry bombs (see *Vehicle Weapon Mounts,* p. B467).

Adventurers could encounter aircraft like this not only during WWI – when they represented most of the world's air power – but also in the 1920s and 1930s. The basic design remained almost unchanged throughout this period, although there were advances, especially in engines and propulsion. After WWI, civilians could buy obsolete planes cheaply – unarmed, of course. Many were converted to light cargo or passenger carriers and used by the first transcontinental airlines.

The pilot requires Piloting (Light Airplane), Gunner (Machine Gun), and Artillery (Bombs). The gunner/observer needs Gunner (Machine Gun), Navigation (Air), and Electronics Operation (Comm).

Breguet Bre 14B-2 (France, 1917-1926)

This two-seater was originally designed for scouting and observation, although the Bre 14B-2 variant was optimized for bombing. Some 5,500 were built, 1,586 of which were bombers. France and the U.S. Army used it during WWI. Many were exported after the war, including to Brazil, Greece, Poland, Siam, and Spain.

The Bre 14 is armed with a fixed, synchronized Vickers Mk II machine gun (see *Vickers Mk I,* p. 131) with a 500-round belt and twin flexible Lewis Mk II machine guns (see *Lewis Mk I,* p. 131) with three 97-round drums each. Hardpoints can carry a bomb load of 720 lbs. – normally, 32 22-lb. MMN bombs (p. 194).

The unarmed *Bre 14T-4* (1919-1926) seated a pilot and three passengers, and was used by small airlines in South America during the 1920s and 1930s.

Junkers J.I (Germany 1917-1918)

The *Infanterieflugzeug I* ("infantry aircraft") was a close-support design used by German forces during WWI. Its armored body made it difficult to shoot down, while superior aerodynamics offset the armor's weight and the craft's low power-to-weight ratio. Only 227 were made.

The J.I is armed with twin fixed, synchronized Maxim LMG08/15 machine guns with 500-round belts and a flexible DWM LMG14 Parabellum machine gun with five 100-round belts; see *Maxim MG08* (p. 233) for both weapons. Hardpoints can carry up to 300 lbs., but a typical load is four 25-lb. PuW12.5 bombs (p. 194).

Dayton-Wright DH-4 (USA, 1918-1919)

The DH-4 was a U.S. redesign of a British craft, the De Havilland D.H.4. Major changes included an American engine and armament. Dayton-Wright made some 3,100 planes, while other companies produced more than 1,700. In 1918, the DH-4 entered service as fighter/bomber with the U.S. Army Air Service and U.S. Marine Corps in France. It remained in use until 1932.

Armament consists of twin fixed, synchronized Marlin M1917 machine guns (see *Colt Model 1895,* p. 130) with 600-round belts and twin flexible Savage-Lewis M1918 machine guns (see *Lewis Mk I,* p. 131) with five 97-round drums each. Hardpoints can carry a bomb load of 320 lbs., with six to 12 25-lb. MK II bombs (p. 194) being typical.

After WWI, many unarmed DH-4s were sold for as little as $3,000. Buyers included small airlines and private citizens. The U.S. Mail used the DH-4 as a courier craft until 1927, replacing the observer's seat with a 500-lb. mail compartment.

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Range	Cost	Locations	Stall	Notes
6	Bre 14B-2	60	0/3	9f	4/56	2.1	0.4	+4	2	3	435	$80,000	O2W2WiX	20	
6	J.I	65	0/3	9f	4/48	2.4	0.3	+4	2	15	130	$100,000	O2W2WiX	25	[1]
6	DH-4	60	0/3	9f	4/62	2.1	0.4	+4	2	3	420	$85,000	O2W2WiX	23	

Notes:

[1] Top armor is thinner – only DR 5 against attacks from above.

WWI Light Tank

Light tanks appear at mid-TL6, propelled by tracks adapted from farming tractors, clad in steel armor capable of deflecting small-arms fire, and armed with a turreted machine gun or light cannon. Major armies use these two-man vehicles as infantry support or escort tanks. For smaller militaries, they're often the only armored fighting machines available. Deployed in sufficient numbers and in concert with infantry, they're quite capable of overwhelming entrenched enemies. Employed piecemeal or without troops to hold the gained ground, though, they'll be picked apart by artillery and antitank weapons. Historically, while light tanks were in front-line service for just a short time, national guard-type units and the ragtag armies of many Third World countries used them until WWII, which puts them in reach of daring adventurers or local warlords.

The tank's driver requires Driving (Tracked) and Mechanic (Tracked). Its commander needs Gunner (Cannon) or (Machine Gun).

Renault FT17 (France, 1917-1918)

The *Char de Faible Tonnage Modèle 1917* ("lightweight tank model 1917") entered service with the French army during WWI. Some 6,250 were built, making the FT17 the world's most numerous armored fighting vehicle until the 1930s. It was exported to Brazil, China, Finland, Japan, Persia, and Spain, among other countries, and copies were produced in Italy, Poland, the Soviet Union, and the U.S. (the U.S. Army called it the M1917 "Six-Tonner"). The design saw service in WWI, many interwar conflicts worldwide, and even WWII – Germany used hundreds of captured FT17s for rear-area patrols in occupied Europe.

The FT17 has two basic variants: one armed with a 37mm gun, the other with a machine gun. A typical unit has two MG tanks for every gun tank, but some countries bought only gun tanks. Armament of the *Char Canon* ("gun tank") consists of an APX SA17 cannon (p. 140) with 237 rounds (225 HE, 12 canister). The *Char Mitrailleur* ("machine gun tank") normally has a Hotchkiss Mle 1914 machine gun (p. 131) with 50 96-round belts, but the U.S. version mounts a Browning M1919 machine gun (p. 132) with 28 150-round belts. In all cases, turret rotation takes two Ready maneuvers per facing.

Top armor is DR 20, underbody armor is DR 15, and the turret has DR 60 all around. The riveted armor is easily pierced at the seams by AP rifle rounds – and even

Inside a TL6 Tank

A TL6 tank is cramped, hot, dirty, and noisy. Merely riding in one costs 1 FP per hour unless you ride with your head outside – which carries its own risks! Combat costs 1 FP every 10 minutes.

While the motor is running, crewmembers communicate at -4 to Hearing unless they have headsets for internal communication. These don't appear until late TL6. The occupants have -10 to hear anything *outside* the vehicle if it's operating, -3 if it isn't.

The crew may ride with the hatches closed ("buttoned-up") or open. With the hatches closed, visibility is extremely limited: a loader often has *no* view to speak of, a turret gunner has a 60° arc of vision in the direction the turret is facing, and a driver or a bow machine gunner has a 90° arc directly forward. The commander enjoys a full 360° arc, however. Even within these arcs, the occupants cannot see anything within five yards of the tank and are at -2 to Vision beyond this range, as the viewing ports or vision blocks are small and relatively high above ground.

Tracked vehicles handle differently from other ground vehicles. Driving (Tracked) defaults to most other Driving specialties at -4. However, a driver used to one tank can generally operate another with only an unfamiliarity penalty (-2 or GM's ruling); see *Familiarity* (p. B169).

TL	*Vehicle*	*ST/HP*	*Hnd/SR*	*HT*	*Move*	*LWt.*	*Load*	*SM*	*Occ.*	*DR*	*Range*	*Cost*	*Locations*	*Notes*
6	Renault FT17	95	-3/5	8fx	1/3	7.2	1	+3	2	45/20	20	$40,000	2CT	[1]

Notes:

[1] Higher DR is for body front, lower DR is for body sides/rear.

non-penetrating hits and nearby explosions can send rivets and screw heads ricocheting around the interior. If an attack inflicts at least 20 points of damage without penetrating DR, roll 1d; a result of 1-3 indicates flying rivets, spall, or a seam-penetrating bullet. Roll on the *Occupant Hit Table* (p. B555) to determine whether this hits a crewman for 2d cutting damage.

The crew consists of the driver in the body and the commander/gunner in the turret. The commander typically gives orders by *kicking* the driver!

1930s Flying Boat

The "flying boat" – a high-winged monoplane with a boat-shaped hull – sees wide use at late TL6. It requires neither runway nor landing strip, just open water. Most models can *only* take off and land on water (although some can use wheeled undercars for takeoff), and are quite seaworthy; crews have been known to set up sails after running out of fuel! Some designs use efficient diesel engines and all have large fuel tanks, giving them long range. These characteristics make flying boats useful for adventuring expeditions, as well as for conventional long-distance airline traffic and military reconnaissance.

The pilot requires Piloting (Light Airplane), while the navigator should know Navigation (Air) and Electronics Operation (Comm). A flight engineer, if present, needs Mechanic (Light Airplane). Armed variants call for Gunner (Machine Gun) and/or Artillery (Bombs).

Dornier Do J Wal (Germany, 1922-1931)

The famous *Wal* ("Whale") flew several spectacular Atlantic crossings and carried Norwegian explorer Roald Amundsen's expedition to the North Pole. Some 300 planes were made, but because Dornier wasn't permitted to manufacture aircraft during the 1920s, most were license-built in Italy, Japan, the Netherlands, Russia, or Spain. Military customers included Argentina, the Dutch East Indies, Italy, Russia, and Spain. Airlines in Brazil, Germany, Italy, and Japan also operated the Wal; notably, Germany's Lufthansa used it for regular traffic in the Baltic Sea.

The Wal is the archetypical flying boat, with its metal boat hull and high wing. Pull and push propellers are mounted with the engines in a nacelle above the wing. The usual crew consists of a pilot and an observer/navigator in the open cockpit, plus a flight engineer. Civilian versions have a crew of two, and seat three passengers in a smokers' cabin and seven in a non-smokers' cabin. A toilet is provided. Military variants usually have two open ring mounts – one bow, one dorsal – mounting machine guns such as the Rheinmetall MG15 (see *Rheinmetall MG34,* pp. 132-133), Lewis Mk II (see *Lewis Mk I,* p. 131), and Degtyarev DA (see *ZiD DP,* p. 132) with a few drums of ammo.

Grumman G-21A Goose (USA, 1937-1945)

The Grumman Goose followed the classic flying-boat outline, with two engines in conventional wing pods – although it differed from most such craft in featuring retractable landing gear. Around 350 planes were built, with Bolivia, Canada, the Dutch East Indies, Great Britain, and Peru receiving exports. Smaller airlines used it extensively, and the U.S. Navy and U.S. Coast Guard adopted it as the JRF Goose (in Coast Guard service until 1954). The Goose would also be a fitting personal vehicle for a millionaire shuttling between the big city and his beach house!

The crew consists of a pilot and a copilot/navigator in the cockpit. A typical civilian cabin layout includes four passenger seats, a small bar, and a toilet. Alternative arrangements have up to six seats or three beds.

The JRF military variants have less-plush furnishings. They can carry two 100-lb. bombs (p. 195) on under-wing hardpoints (see *Vehicle Weapon Mounts,* p. B467). The French navy installed two fixed Browning Mk II machine guns (see *Browning M1919A4,* p. 132) with 500-round belts in the nose and used the craft in Indochina and the Algerian War in the 1950s.

Modern upgrade kits for engines and avionics keep the Goose airborne even today. Around 50 planes still fly in the Caribbean, Canada, and the Pacific Northwest. To see the Goose in action, check out the TV series *Tales of the Gold Monkey* and the action flick *Commando.*

TL	*Vehicle*	*ST/HP*	*Hnd/SR*	*HT*	*Move*	*LWt.*	*Load*	*SM*	*Occ.*	*DR*	*Range*	*Cost*	*Locations*	*Stall*
6	Wal	79	-2/3	12f	3/56	6.3	1.1	+6	2+10	3	1,800	$600,000	gWi	25
6	Goose	74	-2/3	10f	3/97	4.4	0.5	+5	2+4	3	875	$795,000	g3WrWi	33

1930s Sedan

A "sedan" is a roomy four-door passenger car. Most such vehicles seat at least five. At late TL6, these beasts are popular as family cars – and also widely used by criminals and the lawmen who pursue them.

Prior to the introduction of modern, streamlined designs, the typical automobile had a boxy body with rounded front fenders. Running boards on the sides allowed up to four passengers to ride outside (possibly while shooting – see pp. B469-470 for rules). The spacious, sturdily built sedans of the 1930s were among the last cars with these classic features.

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Range	Cost	Locations	Notes
6	RR Phantom II	63	0/3	12f	2/38*	2.5	0.5	+3	1+4	8	250	$105,000	G4W	
6	Cadillac V-16	72	0/3	10f	2/38*	3.5	0.6	+3	1+6	8	200	$65,000	G4W	
6	Armored Cadillac	94	-1/3	10f	2/25*	7	0.5	+3	1+6	15	200	$220,000	G4W	[1]
6	Plymouth PA	50	0/3	11f	2/30*	1.5	0.5	+3	1+4	8	250	$7,700	G4W	
6	Ford V-8	47	0/3	11f	2/39*	1.3	0.5	+3	1+4	8	250	$6,000	G4W	

Notes:

[1] Underbody is unarmored, with only DR 5. The windows (G) have DR 10.

During the "Gangster Era," police agencies and private citizens sometimes armored sedans with boilerplate and bullet-resistant glass. Bonnie and Clyde lined their cars with bulletproof vests (p. 66)! Armor added considerable weight – often to the detriment of handling – but protected against pistol and shotgun fire.

A sedan requires Driving (Automobile) to drive, Mechanic (Automobile) to repair.

Rolls-Royce Phantom II (Great Britain, 1929-1936)

Successor to the famous Silver Spirit of 1904, the Phantom II was *the* Rolls-Royce of the 1930s. Few were alike, as Rolls-Royce produced only the engine and chassis. Several American and British luxury coachbuilders did the bodywork, which was available in numerous styles. Some 1,680 were made.

Cadillac V-16 Imperial Sedan (USA, 1930-1931)

This huge, expensive limousine was popular with "big shots" – including gangster bosses. A total of 3,251 were made. An optional radio receiver was available (add $2,200).

Cadillac V-16 Armored (USA, 1930)

This conversion of the standard V-16 Caddy (above) features armor and exotic built-in gadgets. Mafia boss Al Capone owned *several* Cadillacs of a variety of models, armored to his specifications. President Roosevelt supposedly used one of these vehicles after "Scarface" went to jail.

This particular car has armored windows that slide down a few inches to serve as gun ports (p. 228). There's a trapdoor in the passenger compartment for dropping caltrops (p. 203) as a pursuit deterrent. The spikes cover a 2×2-yard area; each tire moving through them must roll 1d, with 1-4 meaning 2d pi damage. An oil sprayer in the back leaves behind a 5×2-yard oil slick. Anyone driving through this hazard must make a control roll at -3; see *Control Rolls* (p. B466) for the consequences of failure. A radio receiver lets those aboard monitor police-band transmissions.

Plymouth PA (USA, 1931-1932)

The Plymouth PA was a bargain vehicle in a "big car" package. While it looked like some of its upscale competitors, it was underpowered. Nevertheless, its unique "floating power" engine mount gave a smoother-than-usual ride for a four-cylinder car. Some 106,896 PAs were built. An optional radio receiver could be installed at the factory (add $1,100).

Ford V-8 (USA, 1932-1940)

This powerful, sturdy sedan represented the low end of the price range during the 1930s. In its heyday, the Ford V-8 was popular with gangsters and lawmen alike. Its thick skin proved almost "bulletproof" during the long hunt for Bonnie and Clyde. Some 125,000 were made.

WWII Jeep

The early TL7 jeep (explanations for the term's origin vary) is a small, rugged off-road vehicle. A general-purpose utility vehicle, its many uses include service in the liaison, reconnaissance, ambulance, and weapons-carrier roles. Police, farmers, ranchers, game wardens, safari hunters, and explorers also find it indispensable.

A jeep requires Driving (Automobile) and optionally Mechanic (Automobile).

Willys MB (USA, 1941-1945)

The Willys-Overland MB won the U.S. Army contract for a "Truck, Utility, 1/4-ton"; the *Ford GPW* is identical. The two companies built almost 650,000 jeeps. Allied forces received many during and after WWII. Post-war, the vehicle was license-made in France, India, Japan, and elsewhere. Reliable and highly regarded by soldiers everywhere, the jeep was vital to the American war effort and purported to have better off-road capability than a tank. The fact that it had a high center of gravity and was prone to rollovers – which, without a roll bar, were often deadly – did little to diminish its reputation.

The jeep is open-topped, with just a folding windshield and a convertible canvas cover for protection against the elements. Options include a radio (10-mile range). As an

ambulance, it can carry up to three stretchers and a medic. Weapons-carriers have a pedestal mount in the rear for a Browning M1919A4 machine gun (p. 132) or a Browning M2HB HMG (p. 13). A mount for a Browning M1918A2 automatic rifle (see *Browning M1918 BAR,* pp. 112-113) can be installed on the dash in front of the passenger seat.

Special-ops units use heavily armed modifications. A typical British SAS jeep mounts a Browning M2 aircraft HMG (see *Browning M2HB,* p. 133) on the dash in front of the passenger, and twin Vickers G.O. Mk I aircraft MGs (see *Lewis Mk I,* p. 131) on the rear pedestal *and* to the left of the driver's position. Crews typically carry as much ammo as possible.

Over 210,000 jeeps were produced as the *CJ-2A* (1945-1949) for the civilian market. The main difference was a 22-kW power take-off for running machinery (often power tools, pp. 26-27) off the engine. This model could also accept a plow.

Ford GPA (USA, 1942-1943)

Based on automotive components of the Ford GPW (see above), the GPA is an amphibious variant, nicknamed "Seep." It has a propeller screw for water travel and features a front-mounted 1.75-ton winch (ST 30). Some 12,778 were built, but the design wasn't successful on land *or* on water. In 1950-1958, an Australian adventurer traveled around the world in a converted Seep called "Half-Safe."

Willys CJ-5 (USA, 1954-1983)

This is the most numerous post-WWII jeep, developed from the Korean War-era M38A1. It was the first variant optionally available with a diesel engine (HT 11). Over 600,000 were built, and it was also license-made overseas.

Ford M151 MUTT (USA, 1960-1978)

The M151 Multi Utility Tactical Truck (MUTT) resembles the original jeep in appearance. In the 1960s and 1970s, it was the U.S. military's standard light utility vehicle. Several hundred thousand were made and widely exported.

A pedestal mount in the rear takes a Saco M60 machine gun (p. 134) or a Browning M2HB HMG (p. 133). Variants mount a Watervliet M40 recoilless rifle (p. 141) with eight shells (Occ. 2+2) or a Hughes M220 TOW missile launcher (see *Hughes BGM-71A TOW,* p. 151) with two reloads (Occ. 2+1) – neither of which can be fired on the move.

TL	*Vehicle*	*ST/HP*	*Hnd/SR*	*HT*	*Move*	*LWt.*	*Load*	*SM*	*Occ.*	*DR*	*Range*	*Cost*	*Locations*	*Notes*
7	Willys MB	59	0/3	11f	2/32	2	0.4	+2	1+3	4	300	$7,400	O4W(X)	
7	Ford GPA	60	0/3	10f	2/28	2.2	0.4	+2	1+3	4	250	$12,000	O4W	[1]
7	Willys CJ-5	55	0/3	11f	2/32	1.9	0.6	+2	1+3	4	280	$7,500	O4W	
7	Ford M151	54	0/3	11f	2/32	1.8	0.6	+2	1+3	4	300	$8,500	O4W(X)	

Notes:

[1] Amphibious: Water Move 1/3.

WWII Medium Propeller Fighter

As TL6 gives way to TL7, the propeller-driven combat monoplane reaches technical perfection in the medium fighter: a well-armed single-seat aircraft with a powerful engine. Its large payload lets it carry extra fuel for long-range bomber escort – or heavy ordnance for ground attack. At the same time, it's almost as maneuverable as the agile light fighters of its day, allowing effective use as an interceptor.

Such aircraft featured prominently in WWII and Korea, after which jets rapidly replaced them. Obsolete fighters trickled down to minor air forces. They showed up in various conflicts until the 1960s – and even the 1980s, in backwater locales.

The pilot requires Piloting (Light Airplane), Navigation (Air), and Electronics Operation (Comm) to operate the plane – and Gunner (Machine Gun), and possibly Gunner (Rockets) and/or Artillery (Bombs), for the weapons.

Focke-Wulf Fw 190A-6 Würger (Germany, 1943-1944)

The Fw 190 – nicknamed *Würger* ("Shrike") – was probably the best *Luftwaffe* fighter of WWII. Powerful and heavily armed, it was used for both air-superiority and ground-attack missions. Hungary and Turkey received exports. About 20,000 aircraft were made from 1940 to 1945, including some 3,000 of the Fw 190A-6 variant.

Armament consists of twin synchronized Rheinmetall MG17 machine guns (see *Rheinmetall MG34,* pp. 132-133) with 900-round belts in the nose, plus four Mauser MG151/20 autocannon (pp. 133-314) in the wings, two with 250-round belts and two with 125-round belts. (The Fw 190A-6/R1 sub-variant replaces the outer pair of MG151/20s with flush under-wing pods holding *two* MG151/20s apiece with 125-round belts, for a total of six cannon!) The pilot has a reflex sight (+1 Gunner). A 1,100-lb. hardpoint (see *Vehicle Weapon Mounts,* p. B467) under the fuselage can carry a drop tank (+200 Range), four SC50 bombs, or one SC250 bomb (p. 194).

Equipment includes a radio (20-mile range), IFF, and navigation instruments (+3 Navigation). Armored glass gives the canopy (hit location g) DR 25 against attacks from the front. On an occupant hit (see p. B555), the pilot's cockpit armor provides DR 15 from the front and sides, DR 25 from the back.

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Range	Cost	Locations	Stall
6	Fw 190A-6	76	+1/3	11f	3/204	4.5	0.5	+6	1	5	340	$5,000,000	g3WrWi	110
6	P-51D	84	+1/3	11f	3/218	6	0.8	+6	1	5	950	$5,100,000	g3WrWi	84

NAA P-51D Mustang IV (USA, 1943-1945)

Originally designed for export to the RAF as the "Mustang," this sturdy multi-purpose fighter was adopted by the USAAF as the P-51 when the U.S. entered WWII in 1941. It was one of the war's most successful fighters, used for bomber escort, air-to-air combat, and ground attack. Other operators included Australia (license-produced), Canada, China, and Great Britain. Some 15,600 planes were made from 1940 to 1945, including almost 8,000 of the P-51D variant (called "Mustang IV" in Commonwealth service). Post-war, friendly South American and Asian nations received many aircraft. The P-51D served during the Korean War, and the U.S. National Guard flew it until 1957. The Dominican Republic used it until 1983!

The P-51D is armed with six Browning M2 aircraft HMGs (see *Browning M2HB,* p. 133) in the wings – two with 400-round belts, four with 270-round belts. The pilot has a reflex sight (+1 Gunner). A 1,000-lb. hardpoint (see *Vehicle Weapon Mounts,* p. B467) under each wing can carry a drop tank (+620 Range apiece), a 500-lb. bomb (p. 195), or an M10 rocket pod (p. 150).

Accessories include a radio (20-mile range), IFF, and navigation instruments (+3 Navigation). The canopy (hit location g) enjoys DR 30 against frontal attacks, thanks to armored glass. Cockpit armor provides DR 20 from the front and DR 35 from the back against occupant hits (see p. B555).

WWII Medium Tank

The medium tank is the principal armored fighting vehicle of major armies at late TL6 and early TL7. It can hold its own against equivalent enemy equipment – and even against better-armored and -armed *heavy* tanks, if it has the advantage of numbers. While the main battle tank (p. 244) eventually replaces it in wealthy nations, the WWII-era medium tank continues to see service with minor militaries for a long time, showing up on battlefields until the 1950s and in smaller conflicts as late as the 1990s. Even today, private collectors maintain operational antiques.

The driver needs Driving (Tracked) and Mechanic (Tracked); the bow machine gunner/radio operator requires Gunner (Machine Gun) and Electronics Operation (Comm); the commander should have Gunner (Machine Gun); and the gunner uses Gunner (Cannon) and (Machine Gun). The loader can be unskilled – but a ST-based Gunner (Cannon) roll shaves a second off reloading times.

Krupp Panzer IV Ausf H (Germany, 1943-1944)

The *Panzerkampfwagen IV* ("armored fighting vehicle type IV"), which entered *Wehrmacht* service in 1936, was Germany's standard medium tank in WWII. Axis nations Bulgaria, Finland, Hungary, and Romania also received it during the war – as did neutrals Spain and Turkey. After WWII, Egypt, Jordan, and Syria operated second-hand vehicles, Syria using theirs as late as the 1967 war with Israel. About 9,200 Panzer IVs were built up to 1945 – more than any other German tank – in dozens of versions. Of these, 3,774 were the late-model *Ausführung H* (also called SdKfz 161/2) described here.

The tank's main armament is a Rheinmetall KwK40 cannon (p. 141) with 85 rounds (40 APEX, 40 HE, and 5 HEAT) in the turret. A Rheinmetall MG34 machine gun (pp. 132-133) is mounted coaxially with this. The gunner has a 2.4× sight (+1 Acc). Some tanks have a one-shot smoke discharger facing the turret front (one reload). Turret rotation takes three Ready maneuvers per facing.

The bow machine gunner/radio operator uses a second MG34 in the body front and manages the radio (5-mile range). Many tanks have a *third* MG34 at the commander's

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Range	Cost	Locations	Notes
6	Panzer IV	148	-3/5	10fx	2/12	27.5	1.1	+4	5	280/105	130	$580,000	2CT(X)	[1, 2]
6	M4A1(76)W	158	-3/5	10f	2/12	35	2	+4	5	210/105	120	$477,500	2CTX	[1, 2]

Notes:

[1] Higher DR is for body front, lower DR is for body sides.

[2] Fire extinguisher (p. 229) in engine compartment.

hatch (the Syrians used a DShKM; see *KPZ DShK-38,* p. 133). Total MG34 ammo is 21 150-round belts.

Top and underbody armor is DR 30. The turret has DR 175 in front, DR 155 to the sides, and DR 55 on top. There are DR 15 armor skirts on the turret sides and DR 10 armor skirts on the body sides, which function as spaced armor (p. 229).

Pressed Steel M4A1(76)W Sherman IIA (USA, 1944-1945)

The American M4 medium tank – dubbed the "Sherman" in Commonwealth service and soon everywhere else – was the standard U.S. tank of WWII and the Korean War. Some 50,000 were built until 1946, of which 3,426 were of the M4A1(76)W version ("Sherman IIA") with a 76.2mm gun and protected ("wet") ammo stowage. Most Allied nations received Shermans, including Canada, China, Great Britain, and the Soviet Union. Second-hand vehicles were widely distributed after the war. Upgraded Shermans saw action with Israel until the 1970s, and remained in service with Argentina and Paraguay into the 21st century! Shermans are a staple in Godzilla movies, where they're always outgunned.

Turret armament consists of a Watervliet M1 cannon (p. 141) with 71 rounds (39 APEX and 32 HE). A Browning M1919A4 machine gun (p. 132) is mounted coaxially with this. The gunner has a 3× sight (+1 Acc). An M3 mortar (see *Royal Ordnance ML 2" Mk II,* p. 146) with 12 smoke shells is installed in the turret roof. There's a Browning M2HB heavy machine gun (p. 133) with six 100-round belts at the commander's hatch, and a gun port on the turret's left side. Turret rotation takes three Ready maneuvers per facing.

A second M1919A4 is fitted in the body front. Its gunner also operates the radio (10-mile range). Total ammo for the M1919A4s is 25 250-round belts.

Top and underbody armor is DR 50. The turret has DR 210 in front, DR 140 to the sides, and DR 70 on top.

WWII Medium Truck

Capable of hauling as much as 2 1/2 tons off-road, and double that over roads, the medium cargo truck is the workhorse of the world's militaries at late TL6 and early TL7. It carries supplies (such as food and ammunition), transports troops, and moves artillery. Specialized variants include tankers, fire engines, and workshops. Adventurers will encounter vehicles like this almost everywhere during the 1930s through the 1950s, and not just in military settings – the era's civilian trucks differ mainly in their paint jobs.

A medium truck requires Driving (Heavy Wheeled). Mechanic (Heavy Wheeled) is often useful.

ZiS-5 (Russia, 1933-1958)

The ZiS-5, nicknamed *Tryohtonka* ("three tonner"), was in its day the Red Army's most important truck. An outdated design – loosely copied from a 1920s American Autocar model, and resembling a WWI creation – it was nevertheless extremely sturdy and reliable. Almost a million were built. There were numerous pre- and post-WWII civilian versions: fuel and water tankers, fire engines, and so on.

The basic version has a closed cab and an open cargo bed that can be covered with a canvas roof. Removable bench seats allow 20 passengers to ride in the cargo area. To conserve material, wartime production models have wooden doors and seats, no bumpers, and only one headlight. A variant mounts the traversable BM-13 *Katyusha* rocket launcher (p. 239) in the bed; the crew consists of a driver, a gunner, and an assistant.

Opel-Blitz Typ S (Germany, 1937-1944)

The *Blitz* ("Lightning") was the main German medium truck of WWII, reliable and well-liked by the troops. However, there were never enough of them around. Close to 100,000 were built, some 70,000 of the basic Typ S. There were numerous sub-variants: vans, fire engines, buses, etc.

Most versions have a closed cab and an open cargo bed that can be covered with a canvas roof. Twenty passengers can ride on removable bench seats in the cargo area.

GMC CCKW-353 (USA, 1941-1945)

The GMC "Truck, 2 1/2-ton" was *the* "Deuce-and-a-Half" for the U.S. Army, and widely supplied to Allied forces. Over 570,000 were built. It saw heavy use during WWII and the Korean War, as well as in smaller conflicts throughout the 1940s and 1950s. Its numerous variants included 750-gallon fuel tankers, 700-gallon water tankers, dump trucks, and repair shops with complete workshops (p. 24) of all the standard types.

Both cab and cargo area are open, but can be covered with convertible canvas roofs. A front-mounted five-ton winch (ST 50) is standard. One in four trucks has an optional open ring mount for a Browning M2HB HMG (p. 133) with five 105-round belts over the cab. Removable bench seats allow 20 passengers to ride in the cargo bed. The vehicle also serves as a prime mover for the RIA M2A1 howitzer (p. 141), carrying eight men (the gun's crew plus a driver) and 30 shells.

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Range	Cost	Locations	Notes
6	ZiS-5	75	-1/4	12f	1/19*	6.7	3.3	+4	1+2	5	110	$10,000	G4W	[1]
6	Opel-Blitz	70	-1/4	10f	1/26*	6.4	3.6	+4	1+1	5	200	$20,000	G4W	[1]
6	GMC CCKW-353	88	-1/4	10f	1/22*	10.2	5	+4	1+2	5	220	$25,000	O6W(X)	[1]

Notes:

[1] *Halve* Load off-road.

Cold War Armored Car

Armies employ TL7 armored cars for reconnaissance and infantry fire support. Such vehicles also see extensive use for police operations, internal security, and peacekeeping. Their advantages include good range, quiet operation (relative to *other* armored fighting vehicles!), and small size (making them difficult to spot). Because they aren't front-line combatants, their minimal armor and armaments aren't serious drawbacks. Simple to build, maintain, and operate, most armored cars lack sophisticated equipment.

Military forces make wide use of these vehicles from the 1940s to the early 21st century. Paramilitary and police units often employ them, too. Adventurers might encounter armored cars on the battlefield, during a revolution in a banana republic, or in the garage of a collector (who may rent one to movie producers).

The driver requires Driving (Heavy Wheeled) and Mechanic (Heavy Wheeled). The commander needs Electronics Operation (Comm). The gunner uses Gunner (Machine Gun) and/or (Cannon).

Panhard AML60-7 (France, 1961-1999)

The French army and gendarmerie used the *Automitrailleuse Légère* ("light machine gun car") from 1961 to 1990. The vehicle was also exported to over 40 countries – notably smaller African and South American nations, in whose armies it often represented the heaviest armor available. Buyers included Algeria, Iraq, Ireland, and Somalia. France produced some 4,800 AMLs, of which 1,960 were AML60-7s. South Africa made a licensed copy. From the 1990s, many vehicles received diesel engines (HT 10x, Range 495) as upgrades.

The driver sits in the body, while the commander/loader and gunner ride in the turret. The commander operates the radio (22-mile range). The gunner has a 5× sight (+2 Acc) and a searchlight (0.25-mile range). Armament consists of a DTAT MR60CS gun/mortar (p. 141) with 63 rounds (40 HE, 5 HEAT, 10 smoke, 5 illumination, and 3 canister), plus twin coaxial MAC AA7.62NF1 machine guns (p. 135) with 19 200-round belts. A one-shot smoke discharger faces the turret front (two reloads). Turret rotation takes three Ready maneuvers per facing.

Top and underbody armor is DR 20. The turret has DR 35 all-around and DR 20 on top.

GAZ BRDM-2 (Russia, 1963-1987)

The *Bronevaya Razvedyvatelnaya Dozornaya Mashina-2* ("armored reconnaissance vehicle") – also called the BTR-40P2 – was manufactured in *huge* numbers. The Soviet army used it extensively. Exports went to over 45 countries worldwide.

The driver and commander are seated in the body. Two passengers can sit behind them – one of whom often mans the sensors. The gunner rides in the small turret.

Turret armament consists of a ZiD KPVT heavy machine gun (see *ZiD KPV,* p. 314) with 10 50-round belts and a coaxial KMZ PKT machine gun (see *KMZ PK,* p. 135) with eight 250-round belts. The gunner has a 4× sight (+2 Acc). Turret rotation takes two Ready maneuvers per facing.

Driver and commander have active IR sights, with an IR headlight (70-yard range) and an IR searchlight (0.25-mile range), respectively; see *IR Illumination* (p. 47). Other equipment includes a radio (12-mile range), navigation instruments (+3 Navigation), and a chemical detector (pp. 48-49). The BRDM-2 is amphibious, with a propeller screw for water travel. It has a 4.4-ton winch (ST 47) mounted in front and a gun port for a Kalashnikov rifle (p. 114) in either side of the body.

Rear and top armor provides DR 20. Underbody armor is DR 7. The turret has DR 40 all-around and DR 20 on top.

TL	*Vehicle*	*ST/HP*	*Hnd/SR*	*HT*	*Move*	*LWt.*	*Load*	*SM*	*Occ.*	*DR*	*Range*	*Cost*	*Locations*	*Notes*
7	AML60-7	88	-1/4	10fx	1/28	6.1	1	+3	3	35/20	375	$150,000	T4W	[1, 2, 3]
7	BRDM-2	96	-1/4	10f	1/30	7.7	0.4	+3	3+2S	40/20	450	$75,000	t4W	[1, 2, 4, 5]

Notes:

[1] Higher DR is for body front, lower DR is for body sides.

[2] Fire extinguisher (p. 229) in engine compartment.

[3] Run-flat tires (p. 229).

[4] CTIS (p. 229).

[5] Amphibious: Water Move 1/3.

Cold War Light Helicopter

This is a small, highly maneuverable multi-purpose helicopter. Its main military roles are liaison and reconnaissance. Armed versions also see front-line service with major armies at TL7. Military and paramilitary forces continue to use them at TL8, primarily in supporting roles.

Civilian applications for light helicopters include traffic control, police observation, SWAT team insertion, search and rescue, support of offshore oil rigs, TV coverage, and short-range transportation for tourists and corporate executives. Such vehicles are the most common aircraft over major Western cities (and have been since the 1980s) – non-military operators appreciate their low cost and modest maintenance requirements. Adventurers could plausibly hire or *own* them.

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Range	Cost	Locations	Stall
7	Alouette III	53	+2/2	10f	2/65	2.4	0.7	+4	1+5	3	300	$500,000	GH3W	0
7	OH-6A	43	+2/2	10f	4/75	1.2	0.5	+4	2+2	3	380	$1,000,000	GH2R	0
8	AH-6J	57	+2/2	11f	4/86	2.6	1.1	+4	2	3	310	$1,500,000	GH2R	0

The pilot needs Piloting (Helicopter). Both Navigation (Air) and Electronics Operation (Comm) are common. Armed versions require Gunner (Machine Gun), Gunner (Rockets), and/or Artillery (Guided Missile), depending on armament.

Aérospatiale SA316B Alouette III (France, 1960-1983)

The *Alouette III* ("Lark") saw widespread service with civilian and military operators alike in Europe and the Third World. It was used in several African bush wars, and Argentina employed it in the Falklands War. It was license-made in India, Romania, and Switzerland. Some 1,400 aircraft were built.

The vehicle seats a pilot and five passengers (or two stretchers and two seated), and can carry 1,650 lbs. as externally slung load. Features include a radio (50-mile range), IFF, and navigation instruments (+3 Navigation). Military craft can mount a gun as heavy as the MG151/20 autocannon (pp. 133-134) in the left door. Search-and-rescue versions have a 500-lb. (ST 17) rescue hoist.

Hughes OH-6A Cayuse (USA, 1966-1970)

The U.S. Army adopted the Hughes Model 500 as the OH-6A Light Observation Helicopter (LOH, nicknamed "Loach") and used it heavily during the Vietnam War. Variants showed up in the Israeli invasion of Lebanon, the Kenyan army mutiny, and various South American conflicts. Some 4,700 aircraft were built. While OH-6A production ceased in 1970, the civilian Model 500E is still manufactured. The vehicle was also license-made in Argentina, Italy, Japan, and South Korea. Its distinctive teardrop shape is familiar to viewers of films and TV shows (such as *Magnum, P.I.*).

Besides the pilot and copilot/gunner, the OH-6A seats two passengers in the rear cabin. Removing the rear seats lets it carry two stretchers or four men sitting on the floor. Civilian versions are set up for a pilot and four passengers.

Many OH-6As are armed with a fixed GE M134 minigun (pp. 135-136) with a 2,000-round belt. The copilot has a reflex sight (+1 Gunner). In Vietnam, a Saco M60 machine gun (p. 134) with 15 200-round belts was sometimes mounted in the right door and operated by a passenger. Export versions carry various weapons on two hardpoints (see *Vehicle Weapon Mounts,* p. B467): rocket pods (like the M260; see p. 150), two-shot TOW missile launchers (see *Hughes BGM-71A TOW,* p. 151), or gun pods (containing a Browning M3P HMG with a 250-round belt; see *Browning M2HB,* p. 133).

Accessories include two radios (50-mile range) operated by the pilot, IFF, and navigation instruments (+3 Navigation). Police aircraft mount a searchlight (1-mile range).

MDHC AH-6J Little Bird (USA, 1992)

This gunship version of the MDHC Model 530 is operated by the U.S. Army's 160th Special Operations Aviation Regiment. Eighteen were built. See it in action in the film *Black Hawk Down.*

The AH-6J carries a pilot and a copilot/gunner, but no passengers – ammo occupies the rear cabin! Fixed armament on hardpoints (see *Vehicle Weapon Mounts,* p. B467) consists of two M260 rocket pods (p. 150), plus two GE M134 miniguns (pp. 135-136) with 2,625-round belts. Two Saco MK 19 MOD 3 grenade launchers (p. 143) with 300-round belts can replace either weapon pair. The copilot has a reflex sight (+1 Gunner) and a 16× thermal-imaging sight (+4 Acc and Infravision).

The *MH-6J* (1992) is similar but unarmed. It carries two passengers in the cabin and six more on "planks": bench seats mounted on the exterior. A boom folds out for a quick rappel during air assaults.

Cold War Patrol Boat

Armed river-patrol boats can trace their origins to TL5 monitor steamships. At TL7, advances in materials science yield lightweight synthetic-hulled craft capable of carrying heavy armament and powerful engines. Another crucial development is water-jet propulsion, which reduces draft and permits shallow-water operation.

These boats were a definitive feature of the conflicts in Southeast Asia through the 1960s and 1970s. They also saw use in South America and the Middle East – and not just on rivers. Adventurers could encounter them in a variety of military situations, on coastal patrols, and carrying out narcotics-interdiction activities. As well, collectors own a number of working craft.

The coxswain requires Boating (Large Powerboat) – and Navigation (Sea) and Electronics Operation (Comm) and (Sensors) are all valuable. The engineer's mate needs Mechanic (Large Powerboat). The gunners use Gunner (Machine Gun).

Uniflite PBR MK 2 (USA, 1967-1978)

The Patrol Boat, River (PBR) MK 2 is a light fiberglass craft designed for combat patrols of inland waterways and coastal areas, and for the insertion of small special-ops teams. It was originally built for the U.S. Navy during the Vietnam War. Other operators included the U.S. Army, Bolivia, Burma, Cambodia, Colombia, Israel, the Philippines, South Vietnam, and Thailand. Some 400 boats were built, and about two dozen are still in service with the U.S. Navy. The PBR MK 2 features prominently in *Apocalypse Now* (and guest-stars in *The Simpsons* episode "I Love Lisa").

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Range	Cost	Locations	Draft	Notes
7	PBR MK 2	90	+1/3	11	6/16	8.9	2.4	+5	4+6	3	230	$475,000	Ost3X	2	[1]

Notes:

[1] Sound baffling (p. 229): -3 Hearing.

The crew consists of coxswain, engineer's mate, and at least two gunners. Six passengers can ride on deck. In the event of an occupant hit (see p. B555), the coxswain's ceramic cockpit armor gives him DR 20 from the front, sides, and back.

The bow gun tub, recessed into the deck, mounts twin Browning M2HB HMGs (p. 133) with 500-round belts and is equipped with a searchlight (0.25-mile range). It's open-topped but has all-around DR 35 armor. Mount rotation takes one second per facing. The gunner *can* rotate and fire at the same time.

A pintle mount on the rear deck carries another M2HB with a DR 35 gun shield and a 100-round belt. Two pintles amidships mount one or two Saco M60 machine guns (p. 134), with 200-round belts, or an automatic grenade launcher (see *Saco MK 19 MOD 3,* p. 143). More ammo is stowed below decks – typically, 1,000 rounds of .50 caliber and 7,000 rounds of 7.62×51mm.

Standard accessories include two radios (20-mile range), a surface-search radar (32-mile range), and navigation instruments (+3 Navigation).

Modern HMMWV

The High-Mobility Multipurpose Wheeled Vehicle (HMMWV) is a military-style, wide-bodied off-road vehicle that replaces jeeps and pickup trucks at TL8. Its low center of gravity and high power make it an excellent light cargo carrier. It's sturdy enough to survive the beating at the edge of a battlefield – but not *on* it.

Most HMMWVs are dedicated military vehicles. Civilians may acquire surplus hardware or buy dedicated "civilianized" variants. Nonmilitary versions feature soundproofed interiors, high-gloss paint, and the latest in entertainment electronics . . . but not machine guns.

Use Driving (Automobile) to operate an HMMWV. Armed versions require Gunner (Machine Gun) or Artillery (Guided Missile), depending on armament.

AM General M1025 (USA, 1985-1994)

The M1025 armament carrier is the *original* HMMWV – and the one instantly identified even by civilians as the "Humvee" of U.S. Army fame. The U.S. military acquired it in large numbers, and it was also widely exported. It appears in *Black Hawk Down.*

The M1025 has an enclosed four-seat crew compartment. A hatch in the roof gives access to a rotating pintle mount (takes one second to change facing). The pintle typically carries a Saco M60 machine gun (p. 134) with five 200-round belts, a Browning M2HB HMG (p. 133) with five 100-round belts, or a Saco MK 19 MOD 3 grenade launcher (p. 143) with six 32-round belts.

Usual accessories include a scrambled radio (25-mile range) and a GPS receiver (p. 53). The windows (hit location G) are bullet-resistant plastic with DR 15.

The *M1026* (1985-1994) is the same vehicle with a front-mounted three-ton winch (ST 39).

The *M966* (1985-1994) is also similar, but mounts a Hughes M220 TOW missile launcher (see *Hughes BGM-71A TOW,* p. 150) at the hatch. Six missiles are stowed in the back.

The *Hummer H1* (1992-2006) is a civilian luxury version with airbags (p. 229) and other modern automobile fittings – but no weaponry – for double the cost.

Boeing M998 Avenger (USA, 1990-)

This air-defense version has a two-man cab. A stabilized one-man turret in the cargo bed mounts two pods, each with four GD FIM-92C Stinger missiles (p. 153); this system can launch one missile every five seconds. Coaxially mounted

TL	Vehicle	ST/HP	Hnd/SR	HT	Move	LWt.	Load	SM	Occ.	DR	Range	Cost	Locations	Notes
8	AM General M1025	72	0/5	11	3/33	4.1	1	+3	2+2	8	300	$70,000	G4WX	[1, 2]
8	Boeing M998 Avenger	72	0/5	11x	3/33	4.2	1	+3	2+1	8	300	$125,000	G4WT	[1, 2]
8	OHE M1114	85	0/5	11	3/39	6	2	+3	2+2	40	275	$100,000	G4WX	[1, 2]
8	MSG GMV	74	0/5	11	3/39	5.8	3	+3	3	8	275	$100,000	O4W3X	[1, 2]

Notes:

[1] Improved brakes (p. 229).

[2] Run-flat tires (p. 229).

with the pods is a FN-Browning M296 HMG (see *Browning M2HB,* p. 133) with a 250-round belt. The gunner has a reflex sight (+1 Gunner), an 8× thermal sight (+3 Acc and Infravision), IFF, a 10,000-yard laser rangefinder (+3 Acc), and a targeting computer (+1 Gunner). Turret rotation takes two Ready maneuvers per facing.

O'Gara-Hess & Eisenhardt M1114 (USA, 1996-)

This is an up-armored variant of the M1025, with a strengthened chassis and a more powerful engine. It's intended as a patrol vehicle. The weapon mounted at the roof hatch often has a DR 25 gun shield. The windows (hit location G) have DR 25 armored glass.

MSG GMV (USA, 2003-)

The three-man Ground Mobility Vehicle (GMV) is a highly modified M1113 enhanced-capacity HMMWV. Hundreds have been converted for use by special-ops forces. It has a roof and armored doors (DR 25), but lacks window panes and has an open cargo bed that's usually stacked with fuel and provisions. Its pintle typically carries a Browning M2HB HMG (p. 133) with 10 225-round belts. There are also swing-arm mounts on the co-driver's side and at the rear; these generally bear FN M240D machine guns (see *FN MAG,* pp. 134-135) with 10 200-round belts each. Other equipment includes two radios (25-mile range), a satellite radio (p. 44), and a GPS receiver (p. 53).

Modern Light Monoplane

The light, propeller-driven touring monoplane is designed for private and small-business use. It's a small aircraft, comparatively cheap and easy to maintain, with modest runway and landing-strip requirements. Such planes appear at late TL6, and while TL7-8 versions use turboprop engines and improved materials, they remain similar in concept.

Light monoplanes are widely used as basic trainers for pilots, as general-utility aircraft for tiny carrier businesses (especially in remote areas), and even as family vehicles for wealthy individuals. They're widespread and easy for PCs to acquire. Such planes can also be *armed.* Civilian vehicles equipped with rockets and other ordnance showed up in several African bush wars, while military ones see use as dedicated combat aircraft in the training and counterinsurgency roles.

The pilot needs Piloting (Light Airplane), and will find Navigation (Air) and Electronics Operation (Comm) useful. On armed versions, the weaponry requires Gunner (Machine Gun), Gunner (Rockets), and/or Artillery (Bombs).

Cessna 172R Skyhawk (USA, 1997-)

The Cessna 172 light passenger aircraft was introduced in 1956 and followed over the years by several variants with different engines and equipment. By the time production ceased in 1985, over 42,500 planes had been built in all. The 172 was also license-made in France. Most sales were to civilians, but military customers – including the U.S. Air Force (who designated it the T-41A Mescalero) and two dozen smaller forces – operated the 172 as a trainer. In the late 1990s, production resumed with the 172R and then the 172S.

The 172R seats a pilot and three passengers. A fifth seat can accommodate a child or a petite adult. Standard equipment includes a radio (300-mile range) and digital navigation instruments (+4 Navigation). Numerous accessories are available, including amphibious floats (+$50,000).

LMZ Il-103 (Russia, 1997-)

The Ilyushin 103 is a light passenger aircraft sometimes used for liaison and training. It's popular as a civilian air taxi in Russia. Military operators include Peru and South Korea. The spacious, luxuriously fitted cabin seats four behind the single-seat cockpit. Equipment includes a radio (300-mile range) and navigation instruments (+4 Navigation).

Sadler Piranha (USA, 1998-)

The Sadler Piranha isn't a light touring plane but uses the same technology to create a dedicated "light attack and surveillance aircraft" (LASA). A pusher (rear-mounted) propeller and twin tail provide better visibility and an unrestricted arc of fire – and a martial appearance! The Piranha is designed to offer countries with limited infrastructure or funds a low-level ground-attack aircraft for low-intensity applications. Both Singapore and Turkey considered producing it, but the plane has no buyers as of 2007. The Piranha would suit a well-financed mercenary outfit admirably . . .

Armament consists of two fixed Saco M60C machine guns (p. 134) with 500-round belts in the wings. The pilot has a reflex sight (+1 Gunner). Four 250-lb. hardpoints (see *Vehicle Weapon Mounts,* p. B467) can carry bombs (pp. 194-195) or rocket pods (see *M260,* p. 150).

The Piranha's folding wings let it be stowed on a 2 1/2-ton truck (p. 239). Other features include a radio (300-mile range), IFF, and navigation instruments (+4 Navigation). The windows (hit location G) are bullet-resistant plastic with DR 8.

TL	*Vehicle*	*ST/HP*	*Hnd/SR*	*HT*	*Move*	*LWt.*	*Load*	*SM*	*Occ.*	*DR*	*Range*	*Cost*	*Locations*	*Stall*	*Notes*
8	Cessna 172R	47	+1/3	10f	3/71	1.2	0.4	+4	1+4	3	790	$150,000	G3WWi	29	
8	Il-103	48	+1/3	10f	3/80	1.4	0.4	+4	1+4	3	770	$160,000	G3WrWi	35	
8	Piranha	45	+1/3	11f	3/100	1.4	0.5	+4	1	8	690	$200,000	G3WrWi	36	[1]

Notes:

[1] Fire-suppression system (p. 229).

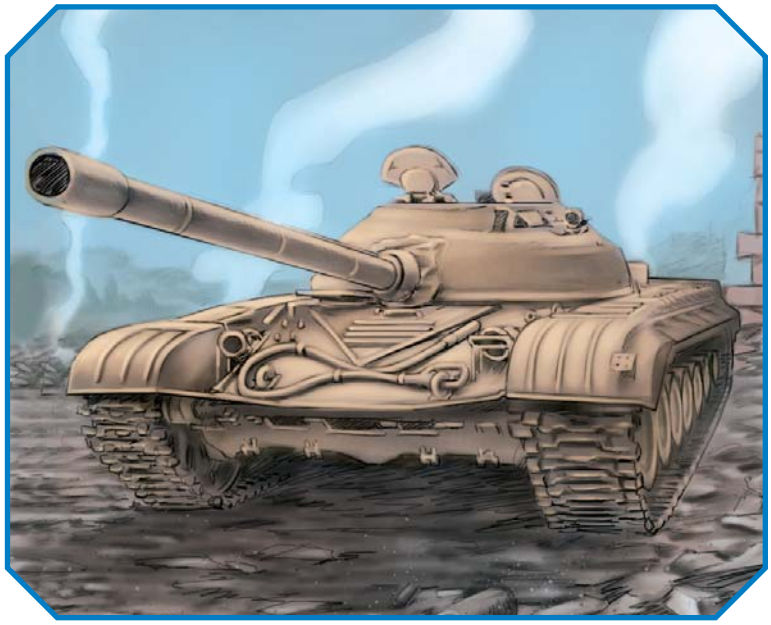
Modern Main Battle Tank

The main battle tank (MBT) is the ultimate land-bound fighting machine at TL7-8. It's capable of destroying any ground vehicle short of another MBT – and often, even rival MBTs aren't safe. Within its class, individual designs evolve so rapidly that last year's model might *already* be obsolete against a certain enemy tank, while next year's design might have a significant edge over it.

Main battle tanks have little purpose beyond direct combat with other MBTs. Their weapons are expensive overkill against less-armored opponents, while their relatively thin top and rear armor is vulnerable to infantry attack in close quarters. Antitank missiles (see *Guided and Homing Missiles,* p. 150) – in particular those launched from helicopter gunships – also pose a serious threat.

Outside a military campaign, PCs will seldom come into contact with MBTs. If they get involved in revolution, civil war, or similar unrest, though, all bets are off. Even civilians might get a closer look . . .

The driver uses Driving (Tracked) and Mechanic (Tracked); the commander needs Gunner (Machine Gun) and Electronics Operation (Comm); and the gunner requires Gunner (Cannon) and (Machine Gun). Designs without an autoloader require a loader. The loader can be unskilled – he's always the most inexperienced crewmember – but a ST-based Gunner (Cannon) roll reduces reloading times by a second.



Uralvagonzavod T-72A (Russia, 1977-1985)

The Soviet T-72 is probably the late 20th century's most widespread MBT. Between 1972 and 1991, some 20,000 T-72s were built in Russia alone. Over half of these were of the T-72A variant; alternate models and upgraded versions are too numerous to mention. The T-72A was exported as the T-72M1. Czechoslovakia, India, Iraq, Poland, Romania, and Yugoslavia produced equivalents under license. The tank saw use in both Gulf Wars and in conflicts in Afghanistan, Chechnya, Ethiopia, and the former Yugoslavia. It also appeared in the WWIII film *Red Dawn.*

The T-72A is inferior to many other modern MBTs. Its disadvantages include obsolete night-fighting equipment and vulnerable ammo storage. Nevertheless, it offers good protection and heavy armament at rock-bottom prices.

The gunner rides in the turret with the main armament: a stabilized Motovilikha D-81TM tank gun (p. 141) with 44 rounds (9 APFSDS, 20 HEAT, and 15 HE), fed by a 22-shot autoloader. A KMZ PKMT machine gun (see *KMZ PK,* p. 135) with eight 250-round belts is mounted coaxially, and a two-shot smoke discharger faces the turret front (two reloads). The gunner has an 8× day sight (+3 Acc), a 4,400-yard laser rangefinder (+3 Acc), and a targeting computer (+1 Gunner). At night, he uses a 5.5× image-intensifying sight (+2 Acc and Night Vision 7) with an IR searchlight (0.75-mile range); see *IR Illumination* (p. 47). Turret rotation takes three Ready maneuvers per facing.

The commander also rides in the turret. He fires an external Molot NSV-12.7 HMG (p. 136) with a collimating sight (+1 Gunner) and three 100-round belts. He has a 5.5× image-intensifying sight (+2 Vision and Night Vision 7) with an IR searchlight (0.25-mile range) for observation, and operates a scrambled radio (12-mile range).

The driver sits in the body. He has an active IR sight with an IR headlight (70-yard range). By injecting diesel into the exhaust manifold, he can generate a smokescreen.

A dozer blade mounted under the vehicle's nose lets the crew clear obstacles and prepare firing positions. The T-72A can carry two drop tanks on the body rear (+60 Range each).

Top armor is DR 90. Underbody armor provides DR 70. The turret has DR 1,375 in front, DR 420 to the sides, and DR 180 on top. Front armor on both body and turret is an early laminate; treat it as *spaced* (p. 229).

TL	*Vehicle*	*ST/HP*	*Hnd/SR*	*HT*	*Move*	*LWt.*	*Load*	*SM*	*Occ.*	*DR*	*Range*	*Cost*	*Locations*	*Notes*
7	T-72A	176	-3/5	9x	2/19	45.7	2	+4	3S	1,155/165	310	$350,000	2CTX	[1, 2]

Notes:

[1] Higher DR is for body front, lower DR is for body sides.

[2] Fire-suppression system (p. 229).

GLOSSARY

High-Tech uses the following terms and abbreviations. For ammunition, only cartridge designations appear. See *Ammunition and Warheads* (p. 161-177) for ammo *types;* e.g., APFSDS.

A/V: Audiovisual.
AA: Antiaircraft.
AAI: Aircraft Armament Inc., USA (manufacturer).
ACP: Automatic Colt Pistol (in cartridge designation).
action: A gun's moving parts and firing mechanism.
AFV: Armored Fighting Vehicle.
AI: Accuracy International, Ltd., U.K. (manufacturer).
AMC: U.S. Army Material Command, USA (manufacturer).
AMT: Arcadia Machine & Tool, Inc., USA (manufacturer).
APC: Armored Personnel Carrier.
APX: Atelier d'Armes de Puteaux, France (manufacturer).
ARGES: Armaturen-Gesellschaft mbH, Austria (manufacturer).
ATF: Bureau of Alcohol, Tobacco, Firearms and Explosives (U.S. Federal agency).
ATK: Alliant Techsystems, Inc., USA (manufacturer).
automatic: A gun that, when fired, ejects the empty case, chambers a fresh cartridge, and is left ready to fire again. Subtypes are *full-automatic* and *semiautomatic* (qq.v.). Also called "self-loading."
B: Belted (in cartridge designation). Refers to a cartridge's strengthened base, not to an ammunition belt.
barrel: The hollow tube that directs the projectile shot from a firearm.
BB: Ball Bullet.
bolt: The device that closes a firearm's *breech* (q.v.).
bolt-action: A manually repeating firearm where drawing back, and often rotating, a bolt handle extracts a spent case and moves a new cartridge into the *chamber* (q.v.).
breech: The rear end of a firearm's *barrel* (q.v.).
bullpup: A firearm with the *action* (q.v.) and ammunition supply behind the firing hand, in the (usually mostly empty) stock. Such weapons are more compact.
caliber: A measure of the interior diameter of a firearm's *barrel* (q.v.) and thus of the projectile fired through it. See *Calibers* (pp. 161-163).
caplock: A firearm that uses a percussion cap to ignite the propellant. See *Black-Powder Locks* (p. 164).
carbine: A short-barreled rifle or a musket. See *Muskets and Rifles* (pp. 107-122).
centerfire: A cartridge with the *primer* (q.v.) in the center of the base, like most modern cartridges.
chamber: The enlarged rear end of a firearm's *barrel* (q.v.), shaped to accept a cartridge.
charger clip: A light metal rail holding cartridges. Used to "charge" the *magazine* (q.v.) with several cartridges at once and then removed. Also called a "charger" or a "stripper clip" (because cartridges are "stripped" into the magazine from the holder).
CIA: Central Intelligence Agency (U.S. Federal agency).
CO^2: Carbon dioxide.
CPS: Cost Per Shot. The cost of one complete round of ammunition, including propellant and projectile (*solid,* unless noted otherwise). See *Ammunition Tables* (pp. 175-177).
cubic foot: A measure of volume, 12"×12"×12".
CZ: Czeská Zbrojovka, Czechoslovakia (manufacturer).
DEA: Drug Enforcement Agency (U.S. Federal agency).
disintegrating belt: A series of cartridges joined side-by-side with small metal links to form a flexible "belt." Upon firing, it falls apart into links and empty cases. See *Machine Guns and Autocannon* (pp. 129-137).
double-action: A firearm *action* (q.v.) that automatically cocks the hammer but also permits manual cocking. See *Trigger Mechanisms* (p. 82).
double-action-only: A firearm *action* (q.v.) that automatically cocks the hammer and doesn't permit manual cocking. See *Trigger Mechanisms* (p. 82).
DTAT: Direction Technique des Armements Terrestres, France (manufacturer).
DWM: Deutsche Waffen- und Munitionsfabriken AG, Germany (manufacturer).
ECCM: Electronic Counter-Countermeasures.
ECIA: Esperanza y Cia SA, Spain (manufacturer).
ejector: A device for quickly expelling spent cartridges from a firearm. See *Reloading Your Gun* (p. 86).
EMT: Emergency Medical Technician.
en bloc clip: A light, spring-loaded metal frame holding cartridges. It and the ammo are inserted into the *magazine* (q.v.) *en bloc* (French for "together"). The gun expels it after all the rounds have been fired.
ERMA: Erfurter Maschinenfabrik GmbH, Germany (manufacturer).
EWt.: Empty Weight.
FBI: Federal Bureau of Investigation (U.S. Federal agency).
FFV: Förenade Fabriksverken, Sweden (manufacturer).
firing pin: The part of a firearm that hits the *primer* (q.v.) in the rear of a cartridge, exploding it and firing the round. Also called a "striker."
flechette: A small, arrow-shaped metal dart used in SAPFSDS, beehive, and MF ammo. See *Ammunition and Warheads* (pp. 161-177).
flintlock: A firearm that uses a piece of flint to ignite the propellant. See *Black-Powder Locks* (p. 164).
FN: Fabrique Nationale des Armes de Guerre SA, Belgium (manufacturer).
forearm: The part of a shoulder arm that surrounds the *barrel* (q.v.), providing a handhold for the supporting hand. Also called the "fore-end" or "handguard."
full-automatic: An *automatic* (q.v.) firearm that discharges several shots in rapid succession with each trigger pull. See *Automatic Weapons* (pp. 82-83).
GAP: Glock Automatic Pistol (in cartridge designation).
gauge: An older *caliber* (q.v.) system, still used for shotguns. See *Calibers* (pp. 161-163).
GAZ: Gorkiy Automobilnyi Zavod, Russia (manufacturer).
GB: Gigabyte; a billion bytes (data capacity).
GD: General Dynamics Corp., USA (manufacturer).
GE: General Electric Co., USA (manufacturer).
Gestapo: Geheime Staatspolizei ("secret state police"). Nazi intelligence service during WWII.
GMC: General Motors Corp., USA (manufacturer).
GPMG: General-Purpose Machine Gun. See *Machine Guns and Autocannon* (pp. 129-137).
GPS: Global Positioning System.
GSG9: Grenzschutzgruppe 9 ("border guard group 9"). German antiterror unit.
H&H: Holland & Holland Ltd, U.K. (manufacturer).
H&K: Heckler & Koch GmbH, Germany (manufacturer).
HASAG: Hugo Schneider AG, Germany (manufacturer).
HEC: Hesse Eastern Co., USA (manufacturer).
HMG: Heavy Machine Gun. See *Machine Guns and Autocannon* (pp. 129-137).
HMMWV: High-Mobility Multipurpose Wheeled Vehicle.
HMS: His/Her Majesty's Ship.
IFF: Identify Friend or Foe. See *Vehicle Components* (pp. 228-229).
IMI: Israel Military Industries Ltd., Israel (manufacturer).
IR: Infrared.
IRA: Irish Republican Army. Guerrilla movement in Northern Ireland.
Izhmash: Izhevskiy Mashinostroitelniy Zavod, Russia (manufacturer).
Izhmekh: Izhevskiy Mekhanicheskiy Zavod, Russia (manufacturer).
KAC: Knight's Armament Co., USA (manufacturer).

KB: Kilobyte; 1,000 bytes (data capacity).
KBP: Konstruktorskoe Buro Priborostroeniya, Russia (manufacturer).
KMZ: Kovrovskiy Mekhanicheskiy Zavod, Russia (manufacturer).
KPZ: Kovrovskiy Pulemotniy Zavod, Russia (manufacturer).
kW: Kilowatt; 1,000 *watts* (q.v.).
LAPD: Los Angeles Police Department.
LAW: Light Antitank Weapon.
LC: Legality Class. See p. B267.
lever-action: A manually repeating firearm where operating a lever extracts a spent case and moves a new cartridge into the *chamber* (q.v.).
limber: A two-wheeled cart that attaches in front of a gun carriage to form a four-wheeled "wagon" for draft animals to pull.
LMG: Light Machine Gun. See *Machine Guns and Autocannon* (pp. 129-137).
LMZ: Lukhovitsy Mashinostroitelniy Zavod, Russia (manufacturer).
LR: Long Rifle (in cartridge designation).
MAC: 1. Manufacture d'Armes de Châtelleraut, France (manufacturer). **2.** Military Armaments Corp., USA (manufacturer).
magazine: Any fixed or removable firearm component holding several cartridges, usually with a feeding spring. Often incorrectly called a "clip."
MAS: Manufacture d'Armes de St. Étienne, France (manufacturer).
MBA: Mainhardt and Biehl Associates, USA (manufacturer).
MBB: Messerschmitt-Bölkow-Blohm GmbH, Germany (manufacturer).
MDHC: McDonnell Douglas Helicopter Corp., USA (manufacturer).
MG: Machine Gun or *Maschinengewehr* (the German equivalent).
MK (or **Mk**)**:** Mark. A model or type.
Mle: *Modèle* (French for "model").
MMG: Medium Machine Gun. See *Machine Guns and Autocannon* (pp. 129-137).
MOD: Model.
MP: 1. *Maschinenpistole* (German for "submachine gun" or "machine pistol"). **2.** Multi-Purpose (ammunition).
MSG: Military Systems Group, Inc., USA (manufacturer).
NAA: North American Aircraft, Inc., USA (manufacturer).
NASA: National Aeronautics and Space Administration.
NATO: North Atlantic Treaty Organization.
NBC: Nuclear-Biological-Chemical.
non-disintegrating belt: A flexible strip made of cloth or metal links and holding a series of cartridges. The gun ejects the empty cases upon firing, but the belt itself remains intact. See *Machine Guns and Autocannon* (pp. 129-137).
NORINCO: North Industries Corp., People's Republic of China (manufacturer).
NOSL: Naval Ordnance Station, Louisville, USA (manufacturer).
NSA: National Security Agency (U.S. Federal agency).
NSG: National Survival Game, Inc., USA (manufacturer).
NSWC: Naval Special Warfare Center, USA (manufacturer).
NYPD: New York Police Department.
OHE: O'Gara-Hess & Eisenhardt, USA (manufacturer).
OSS: Office of Strategic Services. U.S. covert agency during WWII.
PASGT: Personnel Armor System for Ground Troops (armor).
PC: 1. Personal Computer. **2.** Player Character.
PDA: Personal Digital Assistant.
PDW: Personal Defense Weapon. See *Submachine Guns* (pp. 122-126).
pinfire: An old-fashioned cartridge type where the *primer* (q.v.) is ignited when the gun's hammer hits a laterally protruding pin.
pounder: An outdated *caliber* (q.v.) system for artillery. See *Calibers* (pp. 161-163).
PRB: Poudreries Réunies de Belgique, Belgium (manufacturer).
primer: A small cup in the rear of a cartridge holding a sensitive explosive. When struck by the gun's *firing pin* (q.v.), it detonates and sets off the main propellant charge.
pump-action: A manually repeating firearm where sliding the *forearm* (q.v.) back and forth extracts a spent case and moves a new cartridge into the *chamber* (q.v.).
PuW: Prüfanstalt und Werft der Fliegertruppe, Germany (manufacturer).
R: Rimmed (in cartridge designation).
RAF: Royal Air Force.
RB: Rebated Rim (in cartridge designation).
receiver: The part of a firearm containing the *action* (q.v.).
RIA: Rock Island Arsenal, USA (manufacturer).
RIC: Royal Irish Constabulary.
rifling: Spiraling grooves cut along the inside of a gun's *barrel* (q.v.), typical of firearms starting in late TL5. This imparts spin to the projectile, stabilizing its flight and improving accuracy.
rimfire: An old-fashioned cartridge type with priming compound in the case's hollow rim serving as a *primer* (q.v.).
RLM: Raytheon/Lockheed-Martin, USA (manufacturer).
RMS: Royal Mail Ship.
RTE: U.S. Marine Corps Rifle Team Equipment Shop, USA (manufacturer).
S&W: Smith & Wesson, USA (manufacturer).
sabot: From *sabot* (French for "wooden shoe" or "clog"). A lightweight sleeve around an under-caliber projectile. This falls away when the projectile leaves the barrel, resulting in increased velocity. Used by such ammo as APDS and APFSDS; see *Ammunition and Warheads* (pp. 161-177).
SAS: Special Air Service. British special-ops unit.
SEALs: The U.S. Navy's "Sea-Air-Land" special-ops troops.
semiautomatic: An *automatic* (q.v.) firearm that fires one shot per trigger pull.
SIG: Schweizerische Industrie-Gesellschaft, Switzerland (manufacturer).
single-action: A firearm *action* (q.v.) that requires the shooter to cock the hammer manually before each shot. See *Trigger Mechanisms* (p. 82).
SmerSh: Smert' Shipionam ("death to spies"). Soviet military counterintelligence agency.
SMG: Submachine Gun.
smoothbore: A gun without *rifling* (q.v.), like TL3-5 firearms and shotguns of all TLs.
SOE: Special Operations Executive. British covert agency during WWII.
SOV: Special Operation Vest (armor).
spall: A fast-moving armor or hull fragment that enters a vehicle when its armor is penetrated (and occasionally when it *isn't*; see *High-Explosive Squash-Head,* p. 170), endangering crew and components.
SpetsNaz: Spetsialnaya Naznacheniya ("special purpose"). Russian special-operations forces.
SR: 1. Semi-Rimmed (in cartridge designation). **2.** Stability Rating (vehicle stat).
Stasi: Staatssicherheit ("state security"). East German intelligence service.
StG: *Sturmgewehr* (German for "assault rifle").
suppressor: A device for reducing a gun's firing noise. Also called a "sound moderator" or, less accurately, a "silencer." See *Sound Suppressors* (pp. 158-159).
SWAT: Special Weapons And Tactics. A police team for high-risk operations.
TAPCO: The Auto Parts Co., USA (manufacturer).
TB: Terabyte; a trillion bytes (data capacity).
TNT: Trinitrotoluene (explosive).
TOZ: Tulskiy Oruzheinyi Zavod, Russia (manufacturer).
transistor: A solid-state electronic device frequently incorporated into integrated-circuit chips.
TsNIITochMash: Tsentralny Nauchno-Issledovatelsky Institut Tochnogo Mashinostroeniya, Russia (manufacturer).
USAAF: U.S. Army Air Forces.
USAF: U.S. Air Force.
USMC: U.S. Marine Corps.
UV: Ultraviolet.
vacuum tube: An array of electrodes inside an evacuated glass tube.
VHS: Video Home System.
watt: A unit of work; one joule per second.
WPS: Weight Per Shot. The weight of one complete round of ammunition, including propellant and projectile (*solid,* unless noted otherwise). See *Ammunition Tables* (pp. 175-177).
Wt.: Weight. For small arms, *loaded* weight.
ZB: Czeskoslovenská Zbrojovka Brno, Czechoslovakia (manufacturer).
ZiD: Zavod imeni Degtyareva, Russia (manufacturer).
ZiS: Zavod imeni Stalina, Russia (manufacturer).

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The following works are useful for further research or visualization of the items described in ***High-Tech.*** This list favors widely available resources and those that the authors regard as important. There are many other excellent possibilities!

Sourcebooks

Catalogs from equipment manufacturers and retailers are often a valuable and highly detailed source of information on current firearms, vehicles, etc. Many can be ordered for free or found on the Internet. Reprints of old catalogs – dating back as far as the late 1800s (e.g., Sears, Roebuck catalogs) – are treasure troves of historical gadgets, complete with period prices. Catalogs of *replicas* of historical artifacts (from such companies as G. Gedney Godwin) are similarly useful.

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Wild Bunch, The (Sam Peckinpah, 1969). Illustrates what even a single machine gun can achieve against less-well-armed opponents. The Browning M1917A1 is anachronistic for a film set in 1915, however.

Appendix: Gunmen

Guns, ammunition, and related accessories fill much of ***High-Tech*** (pp. 78-178) because they're among the most important tools of TL5-8 adventurers. Dedicated shootists are *popular* as PCs in high-tech, high-action games. Several new options – and expansions on old ones – are useful for such warriors.

Gun Advantages

The most important advantage for gunmen is, of course, Gunslinger.

Gunslinger

see p. B58

If the GM feels that Gunslinger doesn't give enough bang for the buck, he may wish to use these *optional* additions:

When you Move and Attack, you don't get your gun's Acc bonus but may *ignore* its Bulk penalty. This makes the Close-Quarters Battle technique (pp. 250-251) redundant for you. You may ignore any extra penalties for jumping or acrobatic movement on foot, too – you shoot at full skill even while leaping between rooftops, diving through windows, etc.

You can also disregard Bulk in close combat (see *Weapons for Close Combat,* p. B391). You never get an Acc bonus there but you do shoot at full skill.

You may *halve* the default penalties for Fanning (p. 251), Fast-Firing (p. 251), Quick-Shot (p. 252), Thumbing (p. 252), and Two-Handed Thumbing (p. 252). If you choose to raise these techniques, buy them up from their improved defaults.

When you use Fast-Draw (Ammo), total any penalties – such as those in *Fast-Draw from Odd Positions* (pp. 81-82), notably the -2 for Move or Move and Attack – halve the sum, and round in your favor. This makes it easier to reload while moving, crouching behind cover, etc.

Finally, you have access to any cinematic skill or technique that the GM feels could logically work with a gun.

Perks

Two new types of perks are important to gunmen. Either can be gained in play. Each perk costs a point. For more on perks, see pp. B100-101.

Gun Perks

Gun Perks grant veteran gunmen minor advantages or rules exemptions. They embody the little extras that the serious shootist learns throughout his career – tricks that might someday mean the difference between life and death. Such perks require extensive training and familiarity. Those with combat, military, or police skills (the GM decides what qualifies) may buy one Gun Perk per 20 points in such training. Individuals who practice a shooting style (see *Gun Fu,* p. 252) may further buy one of *that style's* perks per 10 points spent on its skills and techniques other than optional traits. A military or police template – or similar lens or skill package with mandatory components – may also qualify as a "style," at the GM's option.

Below, an asterisk (*) indicates a *cinematic* perk that requires Gunslinger (p. B58) or Trained by a Master (p. B93). Perks with a † require specialization by skill, weapon, etc., as noted.

Akimbo*†

You're not restricted by having two hands full of weapons (usually guns!). You can open doors, reload, and so forth without putting anything down. This doesn't help you *fight* using a weapon in either hand – take Ambidexterity (p. B39), Dual-Weapon Attack (p. B230), and/or Off-Hand Weapon Training (p. B232) for that. You must specialize by skill, most often Guns (Pistol).

Armorer's Gift†

You've practiced assembly and disassembly drills on a gun until you can do it in your sleep. Roll against the relevant Armoury or Guns specialty to accomplish this in record time: 10 seconds for a handgun, 30 for a rifle or a submachine gun, or 60 for a machine gun. The conditions are unimportant – you can do this upside down, blindfolded, underwater, etc. You also get +2 on rolls for Immediate Action (p. 81). You must specialize by Guns skill.

Cross-Trained*†

You're familiar with *all* makes and models within a particular Guns specialty – you can pick up any such weapon and fire it at no penalty for unfamiliarity (see p. B169). A slightly toned-down version that covers only *most* types is appropriate for realistic special-ops soldiers who have access to numerous foreign firearms for familiarization. "Special-ops training" replaces Gunslinger or Trained by a Master as the prerequisite. The GM decides what constitutes such training and which guns it covers.

One-Armed Bandit*†

Like Marshall "Rooster" Cogburn in *True Grit* or the T-800 in *Terminator 2,* you can cock a lever-action long arm *one-handed* and *without* changing your grip. The gun's RoF becomes 1 and you must roll against the appropriate Guns specialty before each shot. Failure wastes your turn – treat it as a Do Nothing maneuver. Critical failure means an immediate roll on the *Critical Miss Table* (p. B556)! This perk works only for lever-action weapons, which can be spun around the lever loop. Most suitable rifles and shotguns will require modification by a gunsmith to enlarge the loop.

Pants-Positive Safety*

You can carry a loaded, cocked firearm shoved through your waistband without any risk of accidental discharge – even if you leave the safety off!

Quick-Sheathe†

You've practiced holstering your gun *quickly.* A successful Fast-Draw roll lets you stow your firearm as quickly as it would allow you to draw it; see *Holsters, Scabbards, and Slings* (pp. 153-154). Specialties match those for Fast-Draw (p. B194): Quick-Sheathe (Long Arm) and Quick-Sheathe (Pistol). The latter is common among two-gun pistoleros.

Quick-Swap†

You've perfected the art of juggling a one-handed weapon between hands. Once per turn, *on your turn*, you can switch hands as a free action. The receiving hand must be empty. However, Old West shootists often *draw* two handguns but only *fire* the one in their dominant hand, and then swap pistols once that gun is empty – a feat called "crossing the border." Quick-Swap lets a gunman do this in one second instead of two. You must specialize by weapon skill: Quick-Swap (Pistol), Quick-Swap (Throwing), etc.

Shtick†

As noted under *Shtick* (p. B101), a "cool move" that provides no combat bonuses is a valid perk if it might occasionally be useful. An example is twirling a handgun around your trigger finger, spinning a pistol presented butt-first (usually to surrender it) to shooting position *instantly*. Roll against Guns or DX to perform the Shtick without dropping the gun, firing accidentally, etc.

Sure-Footed†

You've studied low, stable stances for fighting on shaky ground. This lets you ignore the -2 to attack for a specific type of bad footing. You must specialize. Sure-Footed (Slippery) covers mud, oil, and blood. Sure-Footed (Uneven) covers rocks, piles of corpses, etc. Sure-Footed (Naval Training) covers fighting on a rocking ship or boat. The GM may allow other versions.

Weapon Bond

You own a weapon that's uniquely suited to you. Its quality might be no better than normal, but when *you* use it, you're at +1 to effective skill and all techniques based on that skill. This isn't a mystical attunement, nor does it require a specially modified weapon; it's a physical matter of balance, fit to your hand, and intimate familiarity.

You can have a bond to a weapon of any type or quality – even modern, mass-produced firearms display individual quirks and qualities to which an owner may bond. The bond changes neither the weapon nor its price. If the weapon is lost or destroyed, the bond doesn't transfer to a new weapon (not even one from the exact same production batch!), although you can buy a new Weapon Bond in play. To avoid such fates, buy the weapon as Signature Gear (p. B85).

Fictional examples include Indiana Jones' bullwhip and Hellboy's Samaritan revolver. Lara Croft's twin H&K USP pistols qualify, too – but two weapons require *two* Weapon Bonds! This perk needn't be cinematic; consider Texas Ranger Frank Hamer's Colt M1873, "Old Lucky."

Gun Skills

In games with lots of gunplay, two skills merit further interpretation.

Combat Sport†

see p. B184

Since paintball, Airsoft, and MILES simulation participants face no real danger, they use Guns Sport/TL, not Guns. Shooting their "weapons" trains many habits and reflexes applicable to firearms, though; Guns and Guns Sport default either way at -3. Guns Sport *requires* specialization. Specialties match those for Guns (p. B199).

Guns/TL†

see p. B198

Along with operating and reloading firearms under combat stress, Guns has a host of *IQ*-based applications. These include *Cleaning and Maintenance* (p. 80), *Immediate Action* (p. 81), and *Precision Aiming* (p. 84); zeroing weapon-and-sight combinations; such trivial gunsmithing tasks as mounting and removing scopes and other accessories; and matching guns and ammunition to particular combat situations. Make a Per-based Guns roll to identify a familiar weapon by its shape or distinctive sounds.

New Skill

Optionally, the GM may permit marksmen to learn a special cinematic skill.

Zen Marksmanship†

IQ/Very Hard

Defaults: None.
Prerequisites: Gunslinger or Trained by a Master, Guns at 18+, *and* Meditation.

This skill functions identically to Zen Archery (p. B228), but is for point-target small arms (such as pistols or rifles) instead of bows. You must specialize. Use the same specialties as Guns (p. B199); the GM is free to forbid specialties that seem inappropriate, like Grenade Launcher and Light Machine Gun. At high TLs, Beam Weapons (p. B179) specialties might also exist.

Gun Techniques

A *technique* is any feat of skill that one can improve independently of the governing skill. The following techniques obey all of the rules under *Techniques* (pp. B229-230). Being intended for trained gunmen, they depend on Gunner, Guns, and gun-related Armoury and Fast-Draw specialties. Those with "Gunner (Any)" or "Guns (Any)" defaults require specialization by skill. Penalties for unfamiliar firearms affect these techniques exactly as they affect the underlying skills; see *Familiarity* (p. B169).

An asterisk (*) indicates a *cinematic* technique that requires Gunslinger (p. B58) or Trained by a Master (p. B93).

Close-Quarters Battle

Average

Default: Guns (Any).
Prerequisite: Guns (Any); cannot exceed prerequisite skill+4.

You've practiced shooting on the run at nearby targets – a situation that SWAT officers and special-ops soldiers call "close-quarters battle" (CQB). Whenever you take a Move and Attack maneuver (p. B365) to fire at a target whose distance from you in yards doesn't exceed your Per, use Close-Quarters Battle *instead of* Guns. Apply the penalty for shooting on the move: -2 or the firearm's Bulk, whichever is worse. If the result exceeds your Guns skill, reduce it to that level. Then apply any other modifiers for the shot.

Example: Morton Locke has Per 12, Guns (Pistol)-12, Guns (SMG)-12, CQB (Pistol)-15, and CQB (SMG)-15. He runs into a cave carrying a Tommy gun with Bulk -5. Without CQB, the -5 for shooting on the move would put Morton at 12 - 5 = 7. However, at ranges up to 12 yards, he fires at 15 - 5 = 10! If he used his Colt .38 Super pistol with Bulk -2, he would shoot at 15 - 2 = 13, reduced to his Guns (Pistol) level of 12.

If you have the Gunslinger advantage (see p. 249), this technique is redundant for you.

Double-Loading

Average

Default: Fast-Draw (Ammo)-2.
Prerequisite: Fast-Draw (Ammo); cannot exceed Fast-Draw (Ammo) skill.

You've practiced reloading two chambers of a multi-barreled gun or a revolver at once. A successful Double-Loading roll gives all the benefits of Fast-Draw *and* means that each Ready maneuver taken to insert or manually extract one cartridge affects two cartridges. This shaves off one extra second per pair of cartridges if the firearm ejects all of its casings at once, or *two* extra seconds per pair if the weapon requires you to extract each empty by hand. See *Reloading Your Gun* (pp. 86-87).

Fanning

Hard

Default: Guns (Pistol)-4.
Prerequisite: Guns (Pistol); cannot exceed Guns (Pistol) skill.

This technique lets you "buy off" the basic -4 to Guns (Pistol) for fanning a single-action revolver with RoF 1 held in one hand. See *Fanning* (p. 83).

Fast-Firing

Hard

Default: Guns (Any)-4.
Prerequisite: Guns (Any); cannot exceed prerequisite skill.

This technique allows you to "buy off" the -4 to Guns for fast-firing a weapon with RoF 2 or 3. See *Fast-Firing* (p. 84).

Immediate Action

Average

Defaults: Armoury-4, Gunner (Any)-4, or Guns (Any)-4.
Prerequisite: Armoury, Gunner (Any), or Guns (Any); cannot exceed prerequisite skill.

This technique permits you to "buy off" the basic -4 to use an immediate action drill to clear a stoppage. See *Immediate Action* (p. 81). When learning Immediate Action, base Gunner or Guns on *IQ,* not on DX. Gunner versions also default to Armoury (Heavy Weapons)-4, while Guns versions default to Armoury (Small Arms)-4, but you must still choose a Gunner or Guns specialty, not an Armoury one.

*Instant Arsenal Disarm**

Hard

Default: Armoury (Small Arms)-5.
Prerequisites: Armoury (Small Arms) *and* any unarmed grappling skill; cannot exceed Armoury (Small Arms) skill.

This variation on Disarming (p. B230) lets you disarm a gunman by *taking his weapon apart,* as demonstrated by Jet Li in *Lethal Weapon 4.* First, roll against your grappling skill at -4, not this technique, to grab his weapon (see *Grabbing,* p. B370). On a success, immediately roll a Quick Contest: Instant Arsenal Disarm vs. your foe's DX or Retain Weapon. Victory means you remove some important component of his weapon, such as the slide of a semiautomatic pistol, rendering it unable to fire. If your opponent wins, but by less than 3, his weapon is intact but unready. On any critical failure, your rival isn't disarmed *and* may opt to roll at full Guns skill to shoot you in the hand!

You must specialize by type of gun. While the technique defaults to Armoury, its specialties correspond to those for Guns.

Mounted Shooting

Hard

Default: ranged weapon skill-4.
Prerequisites: Riding or a vehicle-operation skill (Bicycling, Driving, Teamster, etc.)†, *and* a ranged weapon skill; cannot exceed ranged weapon skill.

You've practiced shooting a ranged, handheld weapon from a moving mount or vehicle – horse, howdah, stagecoach, open biplane, etc. You must specialize by both weapon skill *and* mount or vehicle type. Use the specialties listed for the two skills chosen as prerequisites.

If you've *improved* this technique, modifiers for a rough ride and/or limited mobility (see *Attacking from Moving Vehicle or Mount,* p. B548) – including those for turning in the saddle to shoot – can't reduce your weapon skill below your Mounted Shooting level when using your chosen weapon from the specified platform. Other penalties apply normally.

Example: Obergefreiter Hugo Elting has Guns (SMG)-13 and Mounted Shooting (SMG/Motorcycle)-11. The various movement penalties for riding on his heavy Zündapp bike won't reduce his skill with his MP40 below 11, before other modifiers.

Remember that skill with a mounted attack can't exceed Riding (for a mount) or Driving, Piloting, or Teamster (for a vehicle). If you're a passenger, you're limited by your driver or pilot's skill.

† The GM may allow Mounted Shooting with other skills involving device-assisted movement, such as Parachuting and Skating.

Precision Aiming

Average

Default: Guns (Any)-6.
Prerequisites: Guns (Any) *and* Observation; cannot exceed Guns skill.

This technique enables you to "buy off" the -6 to Guns when rolling to claim extra Aim bonuses. See *Precision Aiming* (p. 84). Rifle is by far the most common specialty! When learning this technique, base Guns on *IQ,* not on DX.

Example: Red Army sniper Svetlana Romanova has DX 11, IQ 12, and Guns (Rifle) at 14. Her IQ-based Guns skill is 15, making her Precision Aiming (Rifle) default 9. Investing 6 points gives her Precision Aiming (Rifle)-15.

Quick-Shot

Average

Default: Guns (Any)-6.
Prerequisite: Guns (Any); cannot exceed prerequisite skill.

This technique lets you buy off the -6 to use a RoF 2+ gun to shoot two targets in one second. See *Ranged Rapid Strike* (p. 85).

Targeted Attack

Hard

Default: see below.
Prerequisite: Guns (Any); special maximum.

Hits on "high-value" targets – face, chinks in armor, weapons, etc. – are effective fight-stoppers. Policemen often aim for the legs; special-ops soldiers, for the head; and cinematic gunfighters, for the opponent's pistol.

For each Targeted Attack (TA), the gunman must specify a Guns specialty *and* a target. The target can be a hit location other than the torso (Eye, Face, Arm, etc.), chinks in armor at a specific hit location (Torso Chinks *is* valid, although the GM may rule that some hard armor isn't vulnerable), or Weapon. The Guns specialty must cover firearms capable of attacking the selected target – a condition that most often affects attacks to the vitals, eye, or chinks in armor (see pp. B399-400).

The default penalty equals the modifier to hit the target: -2 for Arm or Leg, -3 for Groin or Vitals, -4 for Hand or Foot, -5 for Face or Neck, -7 for Skull, or -9 for Eye. It's -10 for chinks in armor on any of these locations (this *replaces* the usual penalty), but only -8 for chinks in torso armor. Assume -4 for Weapon; use such a TA normally for shortswords, pistols, etc., but roll at +1 vs. large weapons (sword, rifle, etc.), -1 vs. small ones (dagger, holdout pistol, etc.).

By improving TA, the shootist can buy off up to *half* of his default penalty (round up). Write the TA as "TA (**Specialty**/Target)."

Examples: TA (Pistol/Weapon) defaults to Guns (Pistol)-4 and can't exceed Guns-2. TA (SMG/Head) defaults to Guns (SMG)-5 and can't exceed Guns-2.

Targeted Attacks are realistic but complex. The GM is welcome to forbid them if they seem too fussy.

Thumbing

Hard

Default: Guns (Pistol)-2.
Prerequisite: Guns (Pistol); cannot exceed Guns (Pistol) skill.

This technique allows you to "buy off" the -2 to Guns (Pistol) for thumbing a revolver. See *Thumbing* (p. 83).

Two-Handed Thumbing

Hard

Default: Guns (Pistol)-2.
Prerequisite: Guns (Pistol); cannot exceed Guns (Pistol) skill.

This technique permits you to "buy off" the -2 to Guns (Pistol) for fast-firing a single-action revolver held in two hands. See *Fast-Firing* (p. 84).

Gun Fu

To you, it is *daisho* . . . a bow of yew . . . a victory-bright blade. It is an extension of body and spirit with which you sow devastation unknown in simpler times. It is your *gun* – the modern embodiment of martial spirit. *Kung fu* is Chinese for "exemplary effort." Gun Fu applies this concept to mastery of the gun, according the weapon the same reverence that the samurai has for his sword or the English archer shows his bow.

Shootists in such movies as *Hard Boiled, The Matrix, Léon,* and *Equilibrium* take gunplay to a new level. Like other martial artists, Gun Fu stylists are a diverse lot. Cinema often portrays them in contemporary settings, but *Last Man Standing* is set during Prohibition, and the spaghetti Westerns – notably those starring Clint Eastwood – started it all. Where there are guns (or blasters!), there may be Gun Fu. Below is a typical style; many more are possible.

Note for those without ***GURPS Martial Arts:*** A fighting style requires a one-point investment in each skill (excluding skills under *Optional Traits*) plus a point for "Style Familiarity" – a perk that gives access to the style's techniques and other perks.

Way of the Pistol

4 points

This *cinematic* style – typical of contemporary movie pistoleros – melds mysticism with modernity to create a new type of martial artist who relies on studied movement, meditation, arcane philosophy . . . and a custom tactical handgun. Removing the cinematic components would make it reasonable for realistic modern pistol shooters, too.

Skills: Fast-Draw (Ammo); Fast-Draw (Pistol); Guns (Pistol).

Techniques: Close-Quarter Battle (Pistol); Fast-Firing (Pistol); Immediate Action (Pistol); Mounted Shooting (Pistol/Any Driving); Off-Hand Weapon Training (Pistol); Precision Aiming (Pistol); Quick-Shot (Pistol); Retain Weapon (Pistol); Targeted Attack (Pistol/Any).

Cinematic Skills: Blind Fighting; Body Control; Flying Leap; Invisibility Art; Light Walk; Mental Strength; Zen Marksmanship (Pistol).

Cinematic Techniques: Dual-Weapon Attack (Pistol); Instant Arsenal Disarm (Pistol); Whirlwind Attack (Pistol).

Perks: Akimbo (Pistol); Armorer's Gift (Pistol); Cross-Trained (Pistol); Pants-Positive Safety; Quick-Sheathe (Pistol); Quick-Swap (Pistol); Shtick; Sure-Footed (Any).

Optional Traits

Secondary Characteristics: Improved Basic Speed and Per.

Advantages: Acute Vision; Ambidexterity; Combat Reflexes; Enhanced Dodge; Gunslinger; Signature Gear; Trained by a Master.

Skills: Acrobatics; Armoury (Small Arms); Brawling; Breath Control; Connoisseur (Guns); Guns Art; Judo; Karate; Meditation; Observation; Stealth.

Perks: Weapon Bond.

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Additional Material by **David L. Pulver**, **Sean Punch**, **Gene Seabolt**, and **William H. Stoddard**
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